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In full-dose response assays for Pegasus and Talstar, silverleaf whitefly adults are maintained in clip cages and fed cotton leaves treated with various concentrations. Adult mortality is recorded at the conclusion of the trial to determine the level of resistance. See story page 14.
Although it was less than two years ago, it seems lost in the haze of the distant past, when the dams were empty, the crops were dry and the “worst drought in Australia’s history” was not only threatening the future of Australian agriculture, but the very survival of our towns and cities. The experts (including the well respected BOM and CSIRO) were warning that global warming had produced the drought and it was only going to get worse. We would never see those dams full again.

“If we don’t get three inches, man,  
Or four to break this drought,  
“We’ll all be rooned,” said Hanrahan,  
Before the year is out.”

As is often the case with experts, the predictions were not completely accurate. In fact, you could say they were wrong. Anyone with practical experience of Australian weather and the Australian environment knows that the only really predictable thing about it is its unpredictability.

“In God’s good time down came the rain; And all the afternoon  
On iron roof and window-pane It drummed a homely tune.  
“It pelted, pelted all day long, A-singing at its work,  
Till every heart took up the song, way out to Back-o’Bourke.  
And every creek a banker ran, And dams filled overtop;  
“We’ll all be rooned,” said Hanrahan, “If this rain doesn’t stop.”

And stop it will, of course, just as the bush poet John O’Brien predicted in *Said Hanrahan*, back in 1921. Maybe the BOM should employ a few poets to help with their predictions.

Hanrahan was probably the original “whinging farmer” complaining that nothing is ever right. Unfortunately, in Australian farming, it is unusual if everything is just right.

Some Australian cotton farmers are facing serious flooding problems at the moment and the crop overall has suffered from a cool and wet La Niña summer. But the dams and soil profiles are full, prices are reasonable to good and the next drought is in the future somewhere. Things could be worse.

In fact, there is probably more reason for cautious optimism in the cotton industry than has been the case for several years. The crops in southern NSW are looking good and it now looks like the area will become a vibrant permanent cotton production region.

The water supply situation is the best it has been since… forever? So if prices hold up and the La Niña eases off for a while, we could have a few great seasons in front of us.
Making sense of new national work health and safety laws

Occupational health and the safe management of workers and contractors is a complex and critical component of cotton farm businesses.

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CottAssist web tools

Growing a good crop of cotton can often involve the need to make many difficult and complex decisions. To help with these, crop managers across Australia have free access to the continually-updated CottAssist web tools.

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Whitefly resistance monitoring

Resistance monitoring for silverleaf whitefly is one of the current research projects being conducted at DEEDI Entomology Toowoomba. Silverleaf whitefly has the propensity to rapidly develop resistance to insecticides so monitoring provides evidence of changes in resistance frequencies.

See story ............................................................................................................. Page 14

Whole farm water balance

Understanding where water is lost on farm is vital for guiding management decisions and is especially important for anyone considering investment in improving irrigation performance.

See story ............................................................................................................. Page 18

Nip and tuck does wonder for an oldie

An analogy to plastic surgery for a centre pivot refit might sound like an outlandish description but essentially it was just a bit of simple (although still reasonably pricey) adjustments that corrected and restored the functions of this ‘old girl’ and gave her a new lease on life.

See story ............................................................................................................. Page 24

Moisture impact on fibre and ginning

The moisture content in seed-cotton at harvest through to lint in the bale can have significant effects on the quality of the fibre sold to the spinning mill.

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In this issue...

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R&D decisions 2012 underway

CRDC is currently assessing research proposals which have been invited following an earlier round of preliminary project submissions that were received in response to CRDC’s annual open call for proposals in June 2011.

The invited full research proposals (FRPs) will be assessed in February 2012 by the R&D program panels of Cotton Australia and by CRDC management before being assessed by the CRDC board at CRDC’s annual budget meeting held in Narrabri in late March.

Successful FRPs will generally commence in July 2012 and are mostly for three-year investment periods after they commence.

There was strong interest from researchers in the current round and a similar number of proposals is being assessed in 2012 compared with 2010. In 2012, CRDC has seen an increase in submissions covering a range of farming systems research issues.

Five-year R&D planning commences

In 2012 CRDC will start development of a new five-year strategic plan. Government requires all R&D corporations to invest levies and matched Government contributions under an approved five-year strategic plan, and annually, CRDC is required to submit annual R&D budgets for the following financial year. The current Strategic R&D Plan ends in June 2013 and from that point, all new research proposals are required to meet criteria set down in the future R&D plan.

Because the strategic plan is central to R&D investment decisions, CRDC has begun to review what has been achieved under the current plan. The Corporation will begin the process for developing the 2013-2017 Plan in earnest in June 2012. From that point, CRDC will begin consultations widely with the industry, among the research community and the Government. All stakeholders will be invited to be part of the process so that CRDC can submit its final plan for approval by the Government.

Growers innovating with their own R&D projects

Grower associations have responded strongly to CRDC’s offer to fund up to $10,000 for projects that directly deal with R&D adoption, innovation or human capacity.

CGA projects approved or under development to date include:

- Feasibility study into utilising a biomass burner at Tandou gin – Menindee/Lower Darling CGA.
- Capacity building via small projects for St George CGA members and community.
- Promoting local employment opportunities in the Mungindi cotton community.
- Pushing the Boundaries II: Agribusiness Careers – Macintyre CGA.
- Encouraging Cotton – Gwydir Valley Irrigators Assoc. (support for GVIA Landcare Officer).
- Welcome back project – Macquarie Valley Cotton Growers.
- Weather Station for IrrigateWay trials – Walgett CGA.
- Marketing and Market Risk Seminar – Concept of the Dawson Valley CGA (concept also supported by Biloela, Central Highlands, Dirranbandi, Lower Namoi, Upper Namoi, Walgett and St George). Due to the interest this seminar will be offered regionally to CGAs as a roadshow. A contract for this seminar series has been negotiated with Cotton Compass Pty Ltd.
- Lower Namoi CGA already had a small project underway in 2010.

CRDC has contracted Helen Dugdale and Sally Hunter to work with the active CGAs in the development and accomplishment of these projects. Sally Hunter is also working directly with CGAs so that they can build their own capacity to apply for and undertake their own projects involving a broader range of funding bodies. Her work is also proving useful in helping CRDC refine future CGA project establishment processes.
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Industry workforce planning under the spotlight

In November 2011, CRDC convened an inaugural cotton industry Workforce and Human Capacity Forum. This forum brought CRDC, Cotton Australia and Cotton CRC together with a range of industry stakeholders to discuss what was being done currently that would contribute to workforce and human capacity development in the industry. The forum also explored what could be done better in this field.

The forum was seen as a first step in developing strategic, proactive and collective initiatives that would advance the industry’s ability to attract the skilled workforce believed to be needed in the future. The issue of the industry’s capability to maintain and retain its workforce was explored also.

Participants believed the forum has lead to greater collaboration and a strengthening of the initiatives of both Cotton Australia and CRDC in this area. The forum also assisted Cotton Australia’s submission on behalf of the industry to a Senate Inquiry on education in the agricultural sector. Some of the key areas that were identified in the forum that were as a result expressed in the Senate Inquiry submission were:

In the future higher education and skills support for cotton, requires a collaborative approach between industry, government agencies and education sector to attract, develop and retain people in the industry that is:

- Based on data – to identify education/skills problems/needs and monitor performance;
- Focused on delivering benefits to cotton businesses – to ensure accountable provision of relevant education/skills to industry;
- Action oriented – to create momentum and focus on current needs, while recognising that a wide range of actions by different stakeholders is required; and,
- Integrative and flexible – to ensure linkages across cotton and with other initiatives to ensure adaptation.

R&D identifies key role of succession planning

CRDC has initiated a short, yet important project, to develop a better understanding of issues such as attraction and retention of the professional members of the cotton industry workforce.

This project shall also study and report on how future skills and succession issues are dealt with across the industry’s service sector.

The work is being undertaken by social researcher Gordon Stone. Gordon has already interviewed a broad cross-section of the agribusinesses operators within the industry. His inquiry has also included some growers and cotton consultants.

The results will provide CRDC and Cotton Australia with important data upon which some key components of an industry workforce plan can be built to meet future needs.

Third environmental audit about to begin

In 2012 CRDC is commissioning the third cotton industry environmental audit.

Previous industry environmental audits were conducted in 1991 and 2003. Both were regarded as providing great value to the industry — in particular, helping it to focus on areas where its environmental impact could be improved.

To manage the 2012 Audit, CRDC contracted the services of former employee, Rachel Holloway to manage the project. Rachel has worked with a steering committee that involves CRDC and Cotton Australia.

The initial phase of the project entailed development of terms of reference; invitation of capable consultancies to tender for the audit; the tendering and selection processes together with monitoring of progress with the steering committee. Rachel is also providing the committee access to how the successful consultant conducts and reports on the audit.

The tendering process is now complete. The Canberra based consultancy tenderer has accepted the project and CRDC anticipates that the results of the audit will be available at the 16th Cotton Conference in August 2012.

Targeted scholarships show early promise

In late November – early December 2011, the CRDC’s two undergraduate scholarship holders in the Horizon Scholarship program took up their two-week industry placements for the year.

Rebecca Dunsmir, a first year agronomy student at LaTrobe University worked with CGS at Narrabri and Naomi Marks, a second year agribusiness student at UNE spent her two weeks with Cotton Australia in Sydney.

CRDC is confident this scholarship program, managed by RIRDC, will start to gain increasing support from all sectors of the industry that have identified the need to employ new graduates. CRDC will offer a third scholarship in 2012 in the Horizon Scholarship program.
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Making sense of new, national work health and safety laws

By Adam Kay, CEO, Cotton Australia

Occupational health and the safe management of workers and contractors is a complex and critical component of cotton farm businesses. It’s an area in which Cotton Australia has recently expanded its capacity, with Field Policy Officer James Houlahan, based in Moree, dedicating a significant part of his time to this issue.

This comes at a critical time, with new nationally uniform work health and safety (WHS) laws being introduced from January 1 this year. Cotton Australia believes it has an important role in explaining and helping growers adapt to these new, uniform rules that cover employees, contractors, sub-contractors, outworkers, apprentices and trainees, work experience students, volunteers and employers.

The good news is that there’s no need to panic – cotton growers (and all businesses) have until the end of 2012 to transition to the new Model WHS Act and Regulations, and Cotton Australia will be developing a suite of practical information resources throughout the year to help.

Another important point to remember is that for cotton growers, the legal requirements to demonstrate due diligence in managing health and safety risks in the workplace will not change substantially.

The message for the time being is ‘business as usual’ – your legal responsibility or duty of care will continue after January 1, 2012 as will a range of WHS legal responsibilities for all others who are involved in work-related activities including visitors to your farm. It will be very important for cotton growers to use 2012 to inform themselves of the new laws, and start to adjust.

Under its flagship WHS program ‘CottonSafe’, Cotton Australia will be embarking on a large project during 2012 to provide growers, their workers and cotton farm businesses with regular plain English explanations of the new model WHS regulations. This will also include practical guidance to help all relevant parties understand and comply with their WHS responsibilities and maintain records to support a due diligence defence.

In addition Cotton Australia will be working closely with the Australian Centre for Agricultural Health and Safety to develop a suite of practical WHS resources for use in managing health and safety risks on cotton farms. These resources may include, but not be limited to:

- Cotton farm hazard checklists, risk assessments and risk management guides;
- Worker and contractor WHS induction templates;
- Outlines of WHS roles and responsibilities for inclusion in job descriptions;
- WHS record templates for documenting your safety ‘toolbox’ talks;
- WHS record templates for documenting safety inductions and worker training;
- Templates for safe operating procedures and written samples for known high risk work activities on cotton farms; and,
- WHS case studies to help demonstrate the importance of effective and pro-active WHS risk management for your cotton farm enterprise.

The harmonisation of work health and safety laws is part of the Council of Australian Governments’ National Reform Agenda aiming to reduce regulatory burdens and create a seamless national economy.

The regulatory burden and the cost to business and the wider economy in managing and complying with different systems has been estimated at $16 billion per year. This is a primary driver behind the Federal Government’s decision in 2008 to set harmonisation of WHS laws and industrial relations laws as a key priority.

It is anticipated that having a similar set of laws in each State and Territory will provide a number of benefits for business, including:

- A consistent level of safety for all workers in Australia;
- Reduced compliance and regulatory burdens for businesses operating across state and territory boundaries; and,
- A larger resource of health and safety information, delivering clear and consistent information to all Australians.

Cotton Australia will work very hard to support growers during 2012 to adjust to this new set of regulations. For growers who need more information now, a great starting point is the ‘Human Resources’ module of the myBMP program This covers some of the latest research, regulation and best practice for safety across the cotton farm operation and will be updated with new information and resources as they become available.
Everyone wants to be on board the 2012 Cotton Conference

RECORD consecutive seasons, and outstanding prospects through to at least 2014 mean the 2012 Australian Cotton Conference, scheduled for August 14–16 at the Gold Coast is already generating unprecedented interest levels from sponsors keen to demonstrate their commitment to the industry.

Conference chairman, Lyndon Mulligan, said key conference stakeholders Cotton Australia and the Australian Cotton Shippers Association could see the writing on the wall as soon as the dams started filling ahead of planting for the 2012 season – and moved quickly to put in place a committee to help coordinate the event.

“And that was definitely a move in the right direction,” Lyndon said. “By early January, we had already signed up a number of key sponsors, which is clearly a priority in terms of underwriting the viability and success of the event. Clearly the service industry and wider business and research community recognise that our industry is well and truly back in business – which is exciting news for everyone.”

Foundation sponsors Cotton Seed Distributors and the Cotton Research and Development Development Corporation had confirmed their desire to ‘back the conference’ once again, while

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a strong list of major corporate sponsors has already signed up.

Elders confirmed they will be sponsoring a new ‘Delegates Lounge’ area, where guests will be treated to comfortable chairs, tea and coffee in a café style atmosphere. Dupont and Incitec Pivot have reaffirmed their commitment to the Kids’ Club and Welcome Drinks respectively, while Hong Kong based Sunrise Resources will once again be hosting the very popular fashion parade. John Deere will again be a major sponsor, with the popular ‘Picker Bar’ likely to be a social scene focal point. Rabobank has also confirmed their support for the conference, as has Australia’s research powerhouse the CSIRO.

“Everyone just wants to be on board. There was such a positive vibe at the 2010 event. It started raining then it kept raining then the price kept ratcheting higher. The cotton price (for the 2011 harvest) hit A$500 per bale the morning after the conference awards dinner and the phones just ran hot,” says Lyndon.

“And now – with more than 50 per cent of the coming crop already estimated to be sold at A$500 or better, and with the crop expected to be well in excess of last season’s record 4.1 million bales, this industry has never been in a better place. If this 2012 cotton conference – as an integral part of the 2012 cotton season – doesn’t break all records then something is clearly amiss,” Lyndon said.

“From a sponsors perspective, we are working to make sure that their dollars are well spent and that they achieve maximum exposure, maximum networking opportunities, and therefore maximum value for their investment in, and commitment to our industry.”

Conference organisers are hoping delegate numbers exceed 1200 this year, with a mix dominated by cotton growers, but also including agronomists, input suppliers, researchers, cotton traders, financiers, logistics companies and downstream spinners and manufacturers.

The 16th Australian Cotton conference will be held at the Gold Coast Exhibition Centre from August 14–16. Further information for sponsors and exhibitors can be obtained by contacting the conference secretariat on 07 3948 3923 or email cottonshippers@bigpond.com

SUNRISE FOR THE AUSTRALIAN COTTON INDUSTRY

For Hong Kong based Sunrise Resources, sponsorship of the 2012 Australian Cotton Conference was never in question.

Sunrise acts as agent between various Australian cotton shippers, and their spinning mill customers throughout South East Asia, China, North Asia and the Indian Subcontinent, and according to the company’s president, Urs Riederer, the conference provides an excellent forum to renew acquaintances and update himself and his staff on local and international industry issues.

“It provides unmatched opportunities for us to meet with our suppliers, growers and industry as a whole. And recent initiatives to ‘internationalise’ the event mean there is greater exposure to Australia’s spinning mill customers as well as downstream manufacturers.

“This helps build understanding and relationships across all sectors of the industry. Growers clearly need to understand the requirements of spinning mill customers so that they can grow cotton that will be in high demand.

“And at the same time, spinners need to understand where their cotton comes from. From Australia’s perspective, the reputation for clean production techniques and for high corporate social responsibility at the production level is an important selling point, particularly when it is combined with a high quality fibre package,” Urs said.

He believed the Australian Cotton Conference offered the opportunity for industry sectors to communicate through both formal presentations and informal networking sessions.

“This personal communication is invaluable on both a business and personal level. I have been involved in the cotton industry for many years, and have made a great many friends throughout the world. Conferences such as this are so important, as they allow us to renew these acquaintances, to see each other face to face and to share a laugh. It makes international business so much more personal – particularly when the day to day communication is often via email or a quick phone conversation.”

“Personal relationships are what make the cotton industry unique – all around the world,” Urs said.
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Growing a good crop of cotton can often involve the need to make many difficult and complex decisions. To help with these, crop managers across Australia have free access to a continually-updated set of web tools. The CottAssist tools were developed by CSIRO Plant Industry, the Cotton Catchment Communities CRC and the Cotton research and Development Corporation (CRDC). These tools can help growers and consultants refine their management decisions by analysing specific crop information using the latest climate data and knowledge generated through research.

The first step to using the CottAssist tools is to register for a (free) account, which enables the user to access all 10 CottAssist tools and their features and also provides the ability to save and retrieve their own data.

Crop development tool (CDT)
Cotton development can be predicted using daily temperature data (day degrees). The CDT uses this to enable crop managers to check the vegetative and reproductive growth of crops compared to expected rates of growth and development under those conditions. This information can be used to further explore why the crop may or may not be on track and then manage accordingly.

Day degree report
Keeping track of day degree accumulation is widely used to identify the progress towards a cotton development stage (e.g., first square (a flower bud), first flower). The Day Degree Report predicts crop progress through the season using local weather data and sowing time and compares progress with other years using historical climate data.

Last effective flower tool (LEFT)
This LEFT predicts the date after which a flower is no longer likely to have sufficient time to complete development into an open boll. Predicting this date can be used to manage a cotton crop to ensure harvest timeliness to avoid wet and cool weather which is important for picking good quality cotton.

Helicoverpa diapause induction and emergence tool (DIET)
Using local daylength and temperature data, the DIET can predict the percentage of Helicoverpa armigera pupae going into diapause and also when these are likely to emerge as moths. This information can be used to refine decisions for effective pupae busting. This tool was developed in collaboration with the Queensland Department of Employment, Economic Development and Innovation (DEEDI).

Aphid and mite yield loss estimators
Manual calculations of yield loss from pest infestations are complicated and time consuming. These tools allow the user to enter current aphid or mite samples to estimate a rate of pest increase and the potential effect on yield. This allows crop managers to ‘look ahead’ to decide if these pests require control or if natural enemy populations are providing sufficient control.

NutriLogic
Optimising yield, reducing fertiliser costs and minimising greenhouse gas emissions are important considerations for cotton production. NutriLogic uses information collected from soil, petiole, and leaf tests to interpret levels of major nutrients needed for production to generate optimal fertiliser recommendations. This tool can help interpret the in-crop N status from petiole tests and the status of other nutrients from leaf tests.

Seasonal climate analysis
Climate variability challenges all aspects of farming in Australia and cotton production is no exception. This tool can help analyse
seasonal variability or regional influences on crop performance by comparing rainfall, day degrees, number of cold and hot days with long term averages and probabilities.

**Silverleaf whitefly threshold tool**

This ‘newest’ CottAssist web tool allows users to enter regular sampling information to track the development of SLW populations over time. The tool then compares these populations with the control thresholds, which are based on the pest population size, day degrees and crop stage. This tool was developed in collaboration with Emerald based SLW researcher Richard Sequeria and extension officer Susan Mass (both with QDEEDI).

**Water quality calculator**

A potential impact on cotton yield is poor quality water. This tool helps calculate the water quality resulting from mixing water from different sources and highlights the potential impact that this water quality may have on cotton yield.

The development of CottAssist commenced in 2008 and has been an ongoing project for Loretta Clancy and Sandra Williams (nee Deutscher) of CSIRO Plant Industry, who say they hope to continue providing a range of tools for the cotton industry as well as a level of integration with myBMP.

For further information and support contact Loretta.Clancy@csiro.au 02 6799 1547 Sandra.Deutscher@csiro.au 02 6799 1585

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Data generated by the Seasonal Climate Analysis can be easily graphed.

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RESISTANCE monitoring for silverleaf whitefly (SLW) is one of the current research projects being conducted at DEEDI Entomology Toowoomba. Silverleaf whitefly has the propensity to rapidly develop resistance to insecticides so monitoring provides evidence of changes in resistance frequencies. This information is used to update the cotton insecticide resistance management strategy (IRMS) each year to maintain the limited insecticide options into the future and avoid a situation where spray failure occurs due to resistance.

Last season was a somewhat low pressure year for silverleaf whitefly in all cotton districts. The low numbers may have been attributed in part to high rainfall (especially throughout Queensland) which does not favour whitefly population build up. St George and Mungindi districts still reached densities that exceeded the recommended insecticide spray thresholds although they generally fitted into the ‘2A suppression’ zone of management as opposed to the potentially more damaging ‘3B insect growth regulator (IGR)’ zone.

The low abundance of SLW last season challenged the resistance monitoring team to develop new collecting techniques as the existing collection method of selecting leaves with red-eye nymphs is slow and laborious when whitefly are infrequent.

A new method was developed based on collection techniques observed during our CRDC funded 2010 study tour to Arizona and California where researchers used modified vacuum cleaners to collect SLW adults. We found this method to be highly effective this year. Thank you to Matthew Rogan and Chris Monsour who made collections during the season for the resistance monitoring program.

Collections were made from cotton growing districts in Queensland and northern NSW — Emerald, Burdekin, St George, Mungindi and Narrabri. Due to very low whitefly populations, no whitefly were obtained from the Darling Downs. A total of 14 collections were made from the field and maintained in culture to be tested against all four registered SLW insecticides; Admiral, Pegasus, Talstar and Movento.

Resistance testing results

Resistance testing results indicate that SLW sampled from cotton growing regions remain largely susceptible to Admiral. However elevated resistance frequencies have again been recorded from regions such as Bowen and the Burdekin which have intensive mixed cropping farming systems. These higher resistance factors are reflective of a more frequent usage pattern for Admiral and demonstrate that problematic levels of resistance can develop to this product. This should remind growers and advisors of the importance of supporting the IRMS in place within each region and ensure that only one application of each insecticide product is used per season to reduce selection pressure.
Testing for Pegasus indicates resistant individuals are present in the population in all samples tested, but resistance frequencies have not increased since last season and so no changes are required to the IRMS at this stage. Pegasus is not registered in other crops in Australia and is not used widely elsewhere in the world and there is limited information available on SLW’s propensity to develop resistance to this product. One of the few places where Pegasus has been used extensively is in Israel where it has been used for 14 years in cotton without resistance developing.

Talstar has elevated resistance factors in both cotton and horticultural production areas in all samples tested. Resistance
factors for cotton have not changed from past seasons but the very high levels recorded in horticulture (where Talstar is used more frequently) indicate SLW’s propensity to develop resistance to this insecticide. While Talstar is registered for SLW in cotton, it is not recommended for use due to the disruption it causes to natural enemies and poor performance against SLW (Talstar is not translaminar and therefore has poor contact with whitefly which sit on the underside of leaves).

Movento, the newest SLW insecticide option was also tested but as this is the first season that Movento has been registered for cotton no data is available from previous seasons to compare resistance factors. Initial data indicates that populations are highly susceptible to this new product that has a unique mode of action.

The 2010–11 annual resistance monitoring results for SLW were presented to the Transgenic and Insecticide Management Strategy (TIMS) technical panel for consideration in deciding the management strategy for the 2011–12 season. The outcome of this meeting is that no changes to management were required at this stage. Admiral, Pegasus and Talstar all have resistant levels present in the population but these remain unchanged from previous seasons. Higher resistance levels have been recorded for Admiral and Talstar in horticulture in the Burdekin and this demonstrates SLW’s propensity to develop resistance to these products. Using a maximum of one application of these products within a season in compliance with the current IRMS will conserve the efficacy of these products for future years.

This project is funded by the Queensland Department of Employment, Economic Development & Innovation and the CRDC.

### TABLE 1: 2010–11 annual results for SLW resistance monitoring in cotton

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Location</th>
<th>Susceptible</th>
<th>Resistant (Resistance Factors*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admiral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gumlu 1</td>
<td>✓</td>
<td>× (9)</td>
</tr>
<tr>
<td></td>
<td>Gumlu 2</td>
<td>×</td>
<td>(34)</td>
</tr>
<tr>
<td></td>
<td>Mungindi 1</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mungindi 2</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrabri 1</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrabri 2</td>
<td>✓</td>
<td></td>
</tr>
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<tr>
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<tr>
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<td>Gumlu 2</td>
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<td>(7)</td>
</tr>
<tr>
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<td>×</td>
<td>(3)</td>
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<td>St George 5</td>
<td>×</td>
<td>(4)</td>
</tr>
</tbody>
</table>

*Resistance Factor – A Resistance Factor (RF) refers to the dose that it takes to kill a resistant colony compared to a susceptible strain. For example, if a susceptible strain is killed by 1 unit of insecticide, and a resistant strain is killed by 10 units of insecticide, then the resistant strain is 10 times more resistant than the susceptible strain and is said to have a RF of 10. It is difficult to quantify RF as being either low, medium or high as SLW responds differently to individual insecticides and may develop field resistance at RF 10 for one insecticide, but may not develop resistance to RF 1000 for another insecticide. This is a limitation of resistance monitoring as monitoring can only identify changes in resistance factors but cannot predict when increasing RF will lead to field failure. Resistance monitoring is an integral component of any resistance management strategy but needs to be used in conjunction with other resistance monitoring strategies including field observation of insecticide efficacy.

SLW are collected from the field and maintained on potted cotton plants in insect proof cages for use in resistance monitoring bioassays.
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Understanding where water is lost on farm is vital for guiding management decisions and is especially important for anyone considering investment in improving irrigation performance. For example, if you knew that 45 per cent of the water on your farm was lost in storage, would you be more motivated to investigate options for reducing this loss than if storage losses only accounted for five per cent of the water?

To help improve our understanding of these losses, 30 whole farm water balance evaluations were undertaken in the Queensland Murray Darling Basin (QMDB) in the 2009–10 and 2010–11 seasons. Farms were located either on the Darling Downs or in the Lower Balonne/Moonie region (Table 1). Some farms were evaluated over both the 2009–10 and 2010–11 seasons, while others were only evaluated in a single season. This allows the seasonal performance of some farms to be investigated without limiting the size of the overall dataset significantly.

All of the farms grew irrigated cotton, with three farms also growing irrigated corn. For modelling simplicity, only the summer irrigation season was analysed, as this is the primary irrigation season and also when evaporation losses are largest. It is unlikely that the results would change significantly if the analysis were extended across an entire year, although it is possible that the proportion of water lost in storage might increase slightly, especially on farms where water is held in storage but irrigated winter crops are not grown.

The project had previously undertaken measurements of storage evaporation and seepage losses for all farms. Seepage rates ranged from 0.5 mm per day to 6.0 mm per day, with 75 per cent in the range 1.0 mm to 3.5 mm per day.

For the past three years, the Cotton CRC Project “Measurement to improve the water efficiency of on-farm storages in the cotton industry” has been undertaking a variety of activities to enable growers and the industry to better understand storage losses. The main undertaking has been the direct measurement of seepage and evaporation losses from 136 storages using the Irrimate Seepage and Evaporation Meter.

To support these measurements, other activities have included the preparation of whole farm water balances for 30 farms, calculation of the cost effectiveness of storage structural solutions for 15 farms, case studies of grower seepage remediation techniques and the preparation of a set of guidelines to assist storage management and amelioration. While a selection of these results are included in this article, a number of comprehensive publications provide more detail on the Cotton CRC website www.cottoncrc.org.au.

### Key Points

- On average, 63 per cent of all farm water is used by the crop;
- 25 per cent is lost in storages, 11 per cent is lost in fields and less than 1 per cent is lost in channels and drains;
- On individual farms, crop water use ranged from 47 per cent to 86 per cent; and,
- Individual storage losses ranged from 5 per cent to 45 per cent.

### Table 1: Location of Farms

<table>
<thead>
<tr>
<th>Farm</th>
<th>Region</th>
<th>2009–10</th>
<th>2010–11</th>
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<tr>
<td>13</td>
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</tr>
<tr>
<td>22</td>
<td>LB/M</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

1DD = Darling Downs; LB/M = Lower Balonne/Moonie.

Farm 14 consists of two adjoining properties which were analysed separately in 2009–10 and as a single enterprise in 2010–11.

### In Brief...

...
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per cent of storages having seepage of less than 2.0 mm per day. For some farms, the channel and drain seepage rate was assumed to be double that of the on-farm storages. This was to take account of additional water losses that might be incurred when re-wetting channels. For the remaining farms, channel and drain seepage was assumed to be 2.0 mm per day. As can be seen in the results below, the method of accounting for channel and drain seepage did not impact significantly on the overall results, as channel and drain losses were extremely small in all cases. Even if the seepage rates used for the analysis were increased further, the total contribution of channel and drain losses would remain small.

Watertrack Divider was used to undertake the whole farm water balance calculations. Watertrack Divider is a commercially available tool which undertakes a whole farm water balance and is able to divide losses into separate components of storage, distribution and field.

It should be noted that the 2010–11 season was very wet with some farms impacted by flooding. Yield from these farms was significantly reduced, which is evident in the water use performance figures and discussed further below.

Water use

The average final use (or loss) of all available water for all farms is illustrated in Figure 1. The data indicates that approximately 63 per cent of all water is used by the crop. The largest loss of water is through on-farm storages, which account for 25 per cent of the total water, followed by in-field application loss, which accounts for 11 per cent of the total available water. Channel and drain losses are very low at less than one per cent each.

**FIGURE 1:** Final use, or loss, of water for all farms as a proportion of the total water available

![Water Use](image)

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**FIGURE 2:** Water use and loss for all individual farms

![Water Use](image)

**FIGURE 3:** Water loss for all individual farms

![Water Loss](image)

The biggest losses are in storages.
Comparing the use and loss of water on individual farms gives an indication of the range of results. As indicated in Figure 2, crop water use ranged from 47 per cent to 86 per cent. There were no clear indications of regional or seasonal trends in water use or loss.

Figure 3 shows the same data, but with the crop water use removed so the scale can be expanded. Field application losses were typically around 15 per cent or less, although a couple of farms had losses of greater than 20 per cent. A high proportion of field losses often correlated with a low proportion of storage losses, so that the overall loss was not abnormally high. Storage losses ranged from less than five per cent to more than 45 per cent of overall farm water. Such a range shows the importance of understanding the water use characteristics of individual farms when considering how water use efficiency might be improved. Losses in channels and drains were consistently less than five per cent of total farm water.

For those farms that were evaluated in both seasons, there were no consistent seasonal differences. For example, the proportion of water lost in storage on Farm 8 reduced from 14 per cent in 2009–10 to nine per cent in 2010–11 while the same figure for Farm 9 increased from 16 per cent to 21 per cent. Similar differences occurred on other farms. The largest seasonal change for any system component occurred on Farm 15, where the storage loss reduced by 12 percentage points, from 20 per cent in 2009–10 to 8 per cent in 2010–11.

The storage loss is compared to the storage seepage rate in Figure 4. While the seepage rates encountered in these evaluations were all less than would be expected of evaporation in the middle of summer, one might still expect storages with higher seepage rates to correlate with those storages which comprised a larger proportion of total farm losses. But this was not the case, suggesting that other factors such as the length of time a storage contains water have a much more significant impact.

In Part 2 of this article in the next issue of The Australian Cottongrower, Water Matters will take a detailed look at storage seepage and evaporation and the effectiveness of storage structural modifications.
While cotton production has been traditionally the key focus of many irrigated farming operations in Northern NSW and Southern Queensland, it is well recognised that rotational crops such as irrigated wheat play an important role in breaking the lifecycles of many cotton pests and diseases. Unfortunately, growers have struggled to consistently achieve wheat yields in the order of eight tonnes per hectare, a benchmark often achieved in southern NSW.

In response to this challenge, a number of research projects funded by the Cotton and Grains R&D Corporations have been working collaboratively in an effort to identify key management guidelines for achieving eight tonnes per hectare wheat yields. The key research focus areas include establishment, lodging risk reduction, nutrition and irrigation.

The major projects were the Cotton Catchment Communities CRC High Yielding Irrigated Grains in Cotton Farming Systems and Achievable Yields for Irrigated Grains. Key research organisations involved included NSW DPI, Cotton Catchment Communities CRC, CSIRO, QDEEDI, New Zealand Foundation for Arable Research and Griffiths Agriculture.

Crop water use and crop development data from irrigated wheat trials at the Australian Cotton Research Institute (ACRI), and historical climatic data from the Bureau of Meteorology (BOM) were used by CSIRO to model irrigated wheat water requirements under commercial conditions for different regions in the northern cropping zone. One of the key findings of the research is that in dry years, in most locations, a high-yielding wheat crop may require up to 5.5 megalitres of water per hectare through the growing season (see Table 1).

Note the figures in Table 1 indicate crop water demand only, not the total on farm water resources required. On farm water losses incurred in storage, channel and application systems need to be considered in any pre-plant water budget.

These yield and water-use benchmarks only apply when crops are well managed to prevent lodging, and crop growth is not limited by frost, diseases, insects and nutrition.

Lodging is the biggest constraint to achieving these high yields, and lodging risk is greater when there is excessive early growth in the crop. Lodging risk can be reduced through canopy management techniques such as reducing sowing N levels (while increasing in-season N application), growing quick maturing & short statured wheat varieties, establishing the same plant population as those used by dryland farmers, and not overwatering the crop during tilling.

Along with lodging, insufficient irrigation water is the other major limitation to achieving high wheat yields. What the NSWDPI and CSIRO findings suggest is that (depending upon in crop rainfall), an eight tonnes per hectare wheat yield could require up to five spring irrigations in an exceptionally dry year, as this is when the crop uses the bulk of its seasonal water requirement (Figure 1).

With this in mind it’s critical that growers undertake a pre-plant water budgeting exercise including a gross margin analysis. If there is a high probability of insufficient water resources, then growers may need to consider either revising down the yield target, reducing the planted area, or adopting limited water strategies to maximise return per megalitre.

The research at ACRI and other trials sites also confirmed that in grey cracking clays (with no subsoil constraints), fully irrigated wheat will generally extract water to a maximum depth of 90 cm. But under supplementary irrigation scenarios wheat extracted water to a soil depth of 1.5 m (without subsoil constraints). In conclusion 40 mm of deep water could add more than 0.5 tonne per hectare to supplementary irrigated wheat yields in an average year, and nearly one tonne per hectare in a dry year.

TABLE 1: Simulated achievable yields (t/ha) and evapotranspiration (mm) in 90 per cent of years for Kennedy, fully irrigated on two metre beds

<table>
<thead>
<tr>
<th>Location</th>
<th>Range of maximum yield (t/ha)</th>
<th>Range of maximum evapotranspiration water use (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerald</td>
<td>6.2–7.8</td>
<td>360–480</td>
</tr>
<tr>
<td>Dalby</td>
<td>7.0–9.5</td>
<td>430–550</td>
</tr>
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<td>St George</td>
<td>6.4–8.2</td>
<td>360–480</td>
</tr>
<tr>
<td>Goondiwindi</td>
<td>6.8–8.7</td>
<td>410–490</td>
</tr>
<tr>
<td>Walgett</td>
<td>6.7–8.3</td>
<td>420–500</td>
</tr>
<tr>
<td>Gunnedah</td>
<td>7.6–9.6</td>
<td>440–540</td>
</tr>
</tbody>
</table>

1Irrigation Officer NSWDPI Narrabri.
2CSIRO Toowoomba.
ENGINEERING has made Australia a world leader in conservation tillage and zero-till cropping. Ever since 1980, when three professors and a technician from the US state of Nebraska toured Queensland and New South Wales, reporting on the equipment that they had trialled for zero-till planting into standing stubble, Australian farmers have increasingly adopted these systems.

They have been supported by dozens of Australian tillage and planting equipment manufacturers, and agricultural engineers who have refined ground engaging tools, stubble handling ability, and the practice of tramlining or controlled traffic to reduce soil compaction to permanent tracks.

Australian engineers are now researching a new generation of issues that are emerging after decades of no tillage and the control of weeds with herbicides.

Many of these research projects were detailed at the recent Biennial Conference of the Australian Society for Engineering in Agriculture, in line with the conference theme: Diverse Challenges, Innovative Solutions.

In contrast to the Australian situation, engineers around the world are just now seeking to introduce conservation agriculture technology into developing countries as demand for food around the globe increases. But for this wider uptake of conservation agriculture technology to occur, the use of tractors and machinery in developing countries needs to increase.

Agricultural engineer with the FAO in Rome Josef Kienzle, told the conference that the use of tractors in parts of Africa had actually declined in recent decades. He said in sub-Saharan Africa in 1980, there were two tractors per 1000 hectares of arable land, but by 2003 this had dropped to just 1.3 tractors.

“By comparison in the Asia and Pacific regions, in 1980 there were 7.8 tractors per 1000 hectares and this rose to 14.9 by 2003,” Josef said.

“In 1960, Kenya, Uganda and Tanzania alone had more tractors in use than India. But by 2005, India had 100 times more tractors in use than the total number in these three countries. “In Central Africa an estimated 80 per cent of cultivated land is worked manually. In eastern and southern Africa it is about 50 per cent,” Josef said.

Australia also has issues

These might seem like ‘old-fashioned problems’ for highly mechanised and quite sophisticated Australian farmers. But the no-till revolution of which Australia is a leader, is producing its own issues of concern.

In Australia it is estimated that 10 million hectares of cropping land is worked using no-till systems, and engineers are seeking solutions to what might seem like old-fashioned problems, such as controlling weeds with tillage as weeds show resistance to herbicides.

There are reports that some farmers are resorting to old-fashioned methods, counter to conservation tillage principles, such as burning stubble every few years to control diseases like rust and crown rot.

Physical weed control

Newly elected president of the Australian Society for Engineering in Agriculture, Glen Riethmuller, says a group of farmers in one Western Australian wheat belt region is using large mouldboard ploughs to turn over the soil and bury the weed seeds deep below the surface.

Glen, from the Department of Agriculture and Food in Western Australia, also reported to the conference on research that has looked at physical weed control in wide row lupins.

But he said the mechanical cultivating between the lupin rows has not satisfactorily controlled the seed-set of wild radish. He said the wild radish left in the row produced high seed numbers, and he thought that pre-emergence herbicides or other techniques needed to be tested to reduce in-row weeds.

Single disc seeders

Research at the University of South Australia is seeking to improve the performance of single disc seeders in sticky soil conditions.

Ali Khosravani Goshtasb from the research team at Adelaide said handling of sticky soils by disc seeders was still a major limitation for zero-till farmers in Australia.

“Reported problems include uncontrolled soil build-up impairing proper seed placement and increasing depth variability of the seeding disc modules.”

Ali said gauge wheel interaction with the disc increased the soil build-up on the disc.

The project also tested a polymer coated disc which showed less soil build-up than the steel disc.

He said the experiment showed that load on the gauge wheel was a factor with greater pressure resulting in more soil build-up.

The investigation of the positioning of the gauge wheel and the pressure on the wheel needed to be undertaken to reduce soil throw and depth variability.

Glen Riethmuller (Department of Agriculture and Food, Western Australia).
Nip and tuck does wonders for old machine

By Mary Philp, DEEDI, More Profit per Drop Team

An analogy to plastic surgery for a centre pivot refit might sound like an outlandish description but essentially it was just a bit of simple (although still reasonably pricey) adjustments that corrected and restored the functions of this ‘old girl’ and gave her a new lease on life.

The ‘Struanville’ irrigation team, consisting of Rob Carter and his son-in-laws, Matt Finch and Scott Smith, acquired the ‘old girl’ when Rob purchased an adjacent farm in October 2009. The 1983 model was showing her age and exposure to bore water with a high salt content over time had left the machine under performing.

Matt and Scott, determined to give her another go, attended a More Profit per Drop (MPPD) Centre Pivot/ Lateral Move Training course. From this they corrected sprinkler placement and fixed dropper lengths where needed. While the pair were happy to continue this gradual servicing they suspected the ‘old girl’ had bigger issues. They decided to get an outside opinion and spoke to Dalby extension officer Jenelle Hare.

Jenelle organised an initial assessment with the MPPD team, and Pat Daley of Daley Water Services with assistance from the ‘Struanville’ team. The initial assessment conducted in November 2011, according to procedures set out by the American Society of Agricultural Engineers Standard 436.1, revealed the ‘old girl’ was 72 per cent efficient.

This was not surprising given the obvious misgivings of the machine, notably:
■ Uneven dropper lengths;
■ Incorrect sprinkler placement;
■ Water pooling in low spots;
■ Uneven application across machine (ranging from 0 to 74 mm);
■ Insufficient pressure at end of machine; and,
■ Water pooling around tyres.

Pat Daley prepared a report for the ‘Struanville’ team concluding with prioritised recommendations for rejuvenating the centre pivot.

The ‘Struanville’ team had to decide whether to spend money on refitting the machine or do away with it. But who has the money to just replace a machine? So the ‘Struanville’ team shopped around and decided to start off by completing the first of Pat’s recommendations which included:
■ Installing a new sprinkler package with 15 psi regulators; and,
■ Fitting spreader bars on the overhang and last four towers (two bars on each side of the wheels).

Matt and Scott completed the minor procedures over a period of approximately three days and were pleased with the results. The MPPD team and Pat Daley reassessed the machine on January 10, 2012 and determined the ‘old girl’ was now operating at a respectable 92 per cent uniformity (an improvement of 18 per cent).

So what is the benefit of improving uniformity – it is not just cosmetic. Uniform irrigation will lead to better crop performance from a given water allocation and more efficient energy use. The cotton crop which had been replanted shortly before the first assessment, at the second assessment looked good although patchy in a low spot of the field. There had been some concern that the crop may not establish well due to the non-uniform irrigation it initially received. Rain received in early summer assisted establishment. Without rain and without the improvement in the system uniformity the crop may have struggled. Hence the ‘Struanville’ team believe it was money well spent on the machine as they hope to achieve better yields in future with more efficient use of their water and energy resources.

Interestingly the pivot is operated as a half circle at any given time. Cotton is grown in summer on one half of the circle and a winter crop on the other half. The ‘Struanville’ team manage the pivot like this to ensure adequate system capacity is available for the crop from the machine and to provide flexibility with decisions in regard to water available.

Another of Pat Daley’s recommendations which the ‘Struanville’ team is implementing is to fit a manual brush type filter at the pivot tower. Pat emphasises “that a filter is a must for this kind of machine using surface water.”

In the future, the ‘Struanville’ team think that the pump which supplies the pivot will be where they focus their attention as issues were also identified with the pump during the initial assessment of the centre pivot. But in the mean time they will now enjoy irrigating with the ‘rejuvenated girl’.

74% uniformity.

92% uniformity.
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Using cactus as a bioremediation tool in California

By Dennis O’Brien, Agricultural Research Service – USDA

The west side of the San Joaquin Valley in California presents several challenges to growers. Ancient seas that once covered the area left behind marine sediments, shale formations, and deposits of selenium and other minerals. Anything grown there needs to be irrigated, but the resulting runoff, when it contains high levels of selenium, can be toxic to fish, migratory birds, and other wildlife that drink from waterways and drainage ditches. Selenium runoff is subject to monitoring by regional water-quality officials. Periodic droughts and population growth are also squeezing supplies of the fresh water available for irrigation.

“We need to find a way to keep the land productive, but that becomes difficult when you have environmental concerns stemming from soils with these mineral deposits,” says Gary Bañuelos, an Agricultural Research Service plant/soil scientist with the Water Management Research Unit at the San Joaquin Valley Agricultural Sciences Center in Parlier.

Gary believes that he has found a promising alternative: prickly pear cactus (Opuntia ficus-indica), a drought-tolerant plant. Gary’s studies show that certain cacti tolerate salty soil and take up selenium from it. “We’re hoping to produce a new crop on unproductive land and slowly manage the selenium content of the soil in the process of growing it,” Gary says.

Gary and his colleagues from the University of Palermo, Italy, initially evaluated varieties of *O. ficus-indica* from the USDA-ARS National Arid Land Genetic Resources Unit at Parlier, which maintains and evaluates plant germplasm adapted to arid conditions. The team’s evaluation focused on the ability of different varieties to tolerate poor-quality soils in greenhouses. Partners in Palermo included Viviana Catanese and Giuseppe Alonzo.

After making those observations, Gary then spent three years evaluating five prickly pear varieties from Mexico, Brazil, and Chile for salt and boron tolerance in selenium-laden soils by collecting soils and sediments from the area and growing the varieties in field test plots at the research center in Parlier. He followed normal agronomic practices for the area and used a drip irrigation system that produced very little runoff. Results, published in Soil Use and Management, showed the prickly pear grew reasonably well in the poor quality soil with very little water. Unexpectedly, the plants also took up selenium, volatilising some of it and keeping some in their fruit and leaf-like stems (cladodes). Other nonessential minerals were not found in higher concentrations in these plant parts.

Prickly pear was thought to be sensitive to high salinity. But the study results showed that tolerance to salt and boron depends on the genotype. The cactus variety from Chile had the highest tolerance and was the best at producing fruit and

**ARS plant/soil scientist Gary Bañuelos and horticulturist Gabriella Romano survey fruit on prickly pear cacti, *Opuntia ficus-indica*, at the ARS San Joaquin Valley Agricultural Sciences Center in Parlier, California. (Photo Stephen Ausmus)**

**Technician Irvin Arroyo cuts a cladode from a prickly pear cactus. (Photo Stephen Ausmus)**
in test plots were smaller and produced less fruit than those in control plots, but some varieties actually grew better in the test plots. The results were promising enough for selected prickly pear varieties to be considered as a gentle bioremediation tool for soils loaded with selenium.

“We’ve found this plant needs minimal amounts of water, plus it can survive in these saline and boron soils laced with selenium,” Gary says.

This research is part of Water Availability and Watershed Management, an ARS national program (#211) described at www.nps.ars.usda.gov.

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“Using Cactus as a Bioremediation Tool” was published in the January 2012 issue of Agricultural Research magazine.
US
Temperatures across most of the US cotton belt, particularly in the Eastern half, remain well above normal for this time of year. Soil conditions in the Mid-South are favourable after receiving steady rainfall over the past month or so. In Texas, growers continue to evaluate their planting decisions, looking further afield than cotton due to the ongoing drought conditions in the Southwest. This is hampering the marketing of the 2012–13 crop as growers are nervous of forward selling due to increased production risk.

Brazil
Weather conditions in Mato Grosso remain overcast and wet. Crop development is therefore behind schedule and high insect pressure is being witnessed. Soybean harvest remains delayed due to the wet weather, which of course places question marks over what acreage will actually be planted to cotton. Due to the time constraint on growers in getting the cotton planted, some reports are suggesting that cotton production may be slightly down year on year, also due to stronger corn values.

Queensland Cotton has the longest supply chain in the Australian cotton industry. From the field to the shirt you wear, Queensland Cotton is at every step.
Australia
Persistent drizzle and cloud cover has characterised the month of January. Given the amount of rainfall received in most growing regions over the last few weeks, growers are cautious of not over-committing themselves with marketing contracts. As such, potentially 40 per cent of the 4.8 million bale crop remains unsold by growers, we will no doubt see more selling as we near picking and production risk decreases. At this stage, the crop generally appears around three weeks late.

India
Domestic Indian prices have continued to firm over the past month and the rupee exchange continues to weaken against the USD. A going rate for Shankar-6 1-1/8” ex-gin is around 36,650 per candy. Yarn market prices in India also appear to have bottomed out and have found a level of support that enables spinning viability.

China
The Chinese have returned to the markets after their Lunar New Year break with renewed vigor. Domestic prices are supported, and the China National Cotton Monitoring Price has now risen for 29 straight sessions to its thirteen week high (currently at 19,309 yuan/ton). There are increasing number of reports of the Chinese returning to market, looking to top up their low running inventories.

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Since our previous contribution to The Australian Cottongrower was dispatched at the end of November, international raw cotton prices, as measured by the Cotlook A Index, first declined to a low point just above 92.00 cents per lb (Cost and Freight, Far East) in mid-December, before staging a steady recovery. At the time of writing, the Index is hovering just above the dollar mark.

A superficial glance at the global supply and demand position offers little to explain the renewed stability of prices. Cotton Outlook’s statistics for 2011–12 continue to show a massive surplus (four million tonnes plus) of production over consumption during the period. Neither has the macro-economic picture improved to the extent that might justify a shift of sentiment to the bull side. To what then can we attribute the more stable market conditions?

Regular readers of this column will already be aware of the major intervention of the Chinese authorities in both local and international markets. By the start of the Chinese Spring Holiday (January 20), the state reserve had acquired just short of 2.5 million tonnes from the domestic crop – over one third of estimated output, and a staggering figure, by any measure. Although of lesser magnitude, and less precisely documented, purchases from the international market have absorbed another substantial tranche of the world’s exportable surplus. The state reserve is thus in possession of a quantity of cotton not far short of the massive global surplus referred to above. For the time being, the Chinese government effectively holds a global ‘buffer stock’, a term more readily associated with the now largely discredited international commodity agreements. For how long policy-makers will be content for that cotton to be withheld from the market in the interests of price stability is not known, but will clearly be of major importance for the behaviour of prices during 2012.
In addition to these strategic purchases, Chinese mills were also fairly active buyers during the final quarter of 2011. Chinese imports during December totalled over 790,000 tonnes – a monthly record – of which Indian cotton accounted for just under half.

Developments in India itself have also contributed to the market’s firmer appearance since the year-end. Earlier, it had been anticipated that a bumper crop would result in a downturn in local prices, as harvest-time pressures were brought to bear. In the event, forecasts of the crop have tended lower, and the anticipated fall in prices failed to materialise on the scale envisaged. The changing expectations coincided in a recovery of spinning activity, and domestic mills, who had been cautious buyers, re-entered the market. Rising local prices have been reflected in export offers and, since Indian cotton had for some time been the cheapest of the major export crops available to spinners, the effect on the international market has been salutary, and a broader range of origins has been able to compete for export business.

January has also witnessed a slow but steady resumption of mill buying by spinners around the world, who had been exceptionally reluctant buyers of raw cotton during much of last year. Inventories had as a result become seriously depleted, and the relative stability has encouraged many mill buyers to look at their needs afresh. But the return of buying confidence has been slow and faltering, and few spinners are yet prepared to depart from a hand-to-mouth buying policy. Nonetheless, in comparison to the exceptionally poor demand observed earlier, there are some grounds for cautious optimism.

Developments in the broader grains and oilseed complex have also come to the aid of cotton, as drought in parts of South America has adversely affected the outlook for production of various crops, and Chicago futures have risen in consequence. Speculative and fund investors have also returned to the cotton futures market, as suggested by the recovery of trading volume in New York since the year-end.

One other consequence of rising grain prices has been to colour expectations regarding farmers’ choice of crops next season. Cotton Outlook’s initial supply and demand estimates for the new campaign (2012–13) will, as usual, be published next month. It is already clear, but that a diversion of land away from cotton is in prospect in some major cotton-producing countries. Early forecasts for China indicate a fall in cotton plantings of the order of 10 per cent. In the US, the single most significant factor affecting output will be the extent to which the prevailing drought conditions in West Texas are relieved by rainfall over the coming weeks. The outlook for next season’s supply is thus uncertain, but until demand shows more convincing signs of recovery, few observers seem ready to make a bullish case for prices over the coming months.

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Peace of mind, by the bale.
Moisture and its impact on cotton fibre and gin performance

Andrew Krajewski* and Stuart Gordon

The moisture content in seed-cotton at harvest through to lint in the bale can have significant effects on the quality of the fibre sold to the spinning mill. There are optimum moisture levels for seed-cotton and lint for each harvest and ginning process that enable efficient harvesting, ginning, cleaning, baling, and safe storage.

Large amounts of energy are used to dry cotton to improve cleaning and gin processing efficiency, but there is often injudicious use of energy to do this with detrimental effects on fibre quality from drying the fibre too much – effects such as reduced length and increased short fibre content (SFC). The large cost of gas and electricity and discounts applied to shortfalls in fibre quality are forcing ginners to pay closer attention to the management of moisture and energy during cotton ginning.

In this article we report on trials using a new in-line moisture sensing device to measure the moisture content in lint being moved quickly by air (up to 20 metres per second) in transport ducts between the gin and lint cleaner. The device uses a large capacitance sensor and LEDs with transmission sensors as the active elements for sensing moisture and mass.

In a series of experiments conducted over three days, moisture was metered onto spindle and stripper harvested seed-cotton to test the sensor’s response to metered changes in moisture, and the effect of adding moisture before ginning on fibre quality.

Gas and electricity consumption was also recorded to provide information for a model to manage energy costs while...

Large amounts of energy are used to dry cotton.
maintaining adequate fibre moisture. Adequate fibre moisture for this trial was a value above six per cent and below seven per cent. This value was nominated on the basis that fibre at a moisture content of 6.5 per cent has reasonable resilience against breakage particularly during lint cleaning but is still able to be cleaned satisfactorily. Measured data from Day 3 of the trials was used to simulate a model-system whereby seed-cotton is kept above 6.0 per cent moisture by metering dried and humidified air using the sensor onto the cotton prior to ginning. Energy costs were calculated for this scenario.

The testing

Experiments were carried out at a high production four stand Lummus gin located in New South Wales that ordinarily gins around 80,000 bales per year. The gin contains extensive pre-cleaning and drying equipment to deal with stripper harvested cotton and is fitted with Sam Jackson Humidaire burners and hoppers to enable moisture to be added to seed-cotton prior to ginning.

The duct with the non-invasive moisture sensor was custom-fitted into duct work between Gin Stand No. 3 and its first lint cleaner. The sensor is fitted with a data acquisition card that was set to average the sensor’s signal and store data every 30 seconds.

Moisture results from the sensor had a good correlation with off-line results measured using a Vomax 465 microwave moisture tester.

Consistent runs of cotton were selected for the moisture sensor trials on each of the three days. All runs were consistent in variety, production method and paddock (field).

During each run the Humidaire gin hoppers were switched on and off in half hour or slightly longer intervals in order to test the moisture sensor’s responsiveness and to affect changes in fibre properties. Gin runs were planned for the afternoons when ambient conditions were nominally driest, so the benefits of moisturizing the seed-cotton before ginning and lint cleaning would be pronounced. The run on Day 1 was used to check moisture sensor values, Humidaire settings and wetting rates. Runs on Days 2 and 3 incorporated several wetting and drying cycles.

Fibre samples from runs on Days 2 and 3 were collected from every bale in the press room and classed by classer and HVI at Auscott Classing Offices.
Results and discussion

Moisture sensing

Figures 1 and 2 show moisture sensor traces recorded on Days 2 and 3. The traces show clear incremental gains in seed-cotton moisture when the hoppers were switched on and losses when the hoppers were switched off. According to the figures, moisture of the cotton lint does not change instantaneously when the gin hoppers were switched on. The moisture ramped up slowly when the water was added and decreased at a faster rate when the hoppers were switched off. Sensor traces later in the day, towards 5.00 pm, showed increases in moisture as a result of increased relative humidity (RH) late in each day largely as a result of rainfall during the afternoon each day of the trials.

Energy use and costs

Table 1 lists the average volumes of natural gas used by the gin’s burners to generate moist and dry air during the trials (Days 2 and 3). Volumes were averaged across gin outputs of 0.94 bales per minute for spindle picked cotton (Day 2) to 0.60 bales per minute for stripper harvested cotton (Day 3).

Additional energy is required to increase cotton moisture via the gin hoppers and at the battery condenser before pressing. The installation of gas meters prior to each gas burner allowed total gas use to be partitioned into that used for humidifying and drying air. In relative terms gas consumption by the gin hoppers was small (7.6 per cent) in comparison with the gas used to generate humidified air for the battery condenser (13.8 per cent) and to heat air for the dryers (78.6 per cent). The additional cost of gas used to increase the moisture by one per cent (from 5.6 per cent to 6.6 per cent) was 34.5 cents per bale.

Moist cotton generates more load (work) on the electric motors powering the gin saw and extractor drives. The addition of one per cent moisture to lint, to take lint moisture from 5.6 per cent to 6.6 per cent, puts an extra 4.0 per cent load on the motor which translates as an extra 10 kWh for a four stand gin or an extra five to 10 cents per bale depending on throughput.

The additional energy costs can be offset by the improvement in quality of the bale, which nominally translates to a higher price for a bale. The total energy cost for the addition of one per cent extra moisture for these trials was between 39.5 and 44.5 cents per bale.

Effects on fibre quality

Figures 3 to 5 show changes in quality characteristics with changes in moisture content on Day 3. In general, small positive improvements in length were seen as fibre moisture was increased from 5.6 per cent through to 6.6 per cent. Similarly, length uniformity increased by one per cent and short fibre index (SFI) decreased by 0.5 per cent as moisture was increased. The changes reflect many previous studies that have shown benefits of adding moderate amounts of moisture prior to ginning and lint cleaning.

Classing and leaf grade did not change with the one per cent increase from 5.6 per cent to 6.6 per cent.

With no change in classing or leaf grade the main quality determinant on the Day 3 cotton was the fibre’s length and whether or not a bale achieved the base length grade. Increasing fibre moisture beyond 5.9 per cent on the Day 3 cotton
An on-line cotton moisture controller

During the ginning process many irregularities in moisture levels occur. They may be caused by properties of raw material like moisture, density and external factors like temperature and RH. These variations are mainly compensated by the dryer and humidifying systems that are usually manually adjusted by the gin manager.

But manual adjustment is insensitive and causes overlaps in drying and humidification applications. This causes unnecessary gas consumption, which impacts on the overall cost of running the gin. The moisture sensor used in these trials can be used as a moisture controlling device. Such a system can be designed to control dryers and humidifiers simultaneously.

In the system, the moisture sensor would continuously examine the amount of moisture in the cotton by sampling and reporting the cotton condition within set time intervals. A central processing unit (CPU) would collect the moisture data and using fixed delivery times or other feedback sensors, control the action of drying or humidifying equipment.

When an increase in the fibre moisture above the reference value is detected, the humidifiers are switched off and dryers are switched on. When the cotton is too dry the dryers are switched off and humidifiers are switched on to increase the fibre moisture content. There are periods where humidifiers and dryers can be both switched off.

Sensor results from Day 3 (4.1 hours of continuous run) were used to test the simulation. During this period, both dryers and humidifiers could have been switched off 25 per cent of the time, cutting gas costs by $2.16 per bale and saving $83.84 in gas for this period of just over one hour. Extrapolating these savings out to 24 hours production, the total gas savings per day could amount to nearly $500 per day. Assuming Day 3 was an average run day in terms of ambient weather conditions and bale moisture content, the total gas savings out to 24 hours production, the total gas savings per day could amount to nearly $500 per day. Assuming Day 3 was an average run day in terms of ambient weather conditions and bale moisture content, the total gas savings for 12 weeks of gin operation would be over AUD $40,000.

Conclusion

The results indicate the sensor can be used to control dryers and humidifiers to keep fibre moisture consistent and in doing so improve fibre quality and reduce gas consumption. The cost of adding moisture via the gin hoppers was small compared to the gains in fibre quality, largely through the ability to maintain base grade fibre length when fibre moisture was above 5.9 per cent.

Information from the analysis was combined to develop a control system for the gin’s dryers and humidifiers. Using data from trials on Day 3, a simulation of the control system showed a large amount of gas energy could be conserved, with associated large savings each season to gin operating costs (gas).

We gratefully acknowledge financial support from the Cotton Catchment Communities Co-operative Research Centre, the Australian Cotton Research and Development Corporation and CSIRO Plant Industry. We would also like to thank the Australian ginning companies who have assisted us in this research. We also gratefully acknowledge workshop staff at CSIRO Materials Science and Engineering without whom, the device would be just another idea.

### TABLE 1: Average gas volumes used to generate dry and humidified air during gin trial runs (on Days 2 and 3)

<table>
<thead>
<tr>
<th>Gin process</th>
<th>Consumption (%)</th>
<th>Mean M³/bale</th>
<th>Mean M³/bale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas burner – gin hoppers</td>
<td>7.6 ± 1.4</td>
<td>0.023</td>
<td>0.038</td>
</tr>
<tr>
<td>Gas burner – battery condenser</td>
<td>13.8 ± 1.2</td>
<td>0.054</td>
<td>0.069</td>
</tr>
<tr>
<td>Gas burner – driers</td>
<td>78.6 ± 2.5</td>
<td>0.308</td>
<td>0.394</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.393</strong></td>
<td><strong>0.501</strong></td>
<td></td>
</tr>
</tbody>
</table>

increased the number of bales with length values exceeding the base length grade. Bales with length less than 1.125 inches represented 96 per cent of bales with less than 5.9 per cent moisture. This number decreased to 65.4 per cent of bales when moisture was increased above 5.9 per cent.

On current discounts for length (2.5 to 6.0 cents US per pound) the difference in the number of bales achieving base length (an extra 11 bales per hour) amounts to an additional premium of between $3.83 and $9.18 per bale. Subtracting the cost of the energy inputs (39.5 to 44.5 cents per bale) gives the premium of between $3.38 and $8.79 per bale.
A time when minds are more concerned with the basics of life and property immediately following the flood, the question about what to do with cotton crops might have slipped a little on the priority list.

But when circumstances allow, there’ll no doubt be a lot of questions about how to minimise economic flood impacts like:
■ How much of my cotton crop is salvageable?
■ How do I manage my crop to get the most of what remains of the season?
■ What practices will give most bang for my buck and time?

The answer to these questions will depend on how rapidly water drains from fields and will vary on paddocks that have received short-term and long-term inundation. Some will escape with boll rot of lower bolls, other crops may suffer total loss.

The most likely outcome of crop water logging is root anoxia. All roots respire, consuming oxygen and releasing CO₂, so easy access to atmospheric oxygen is essential. Normally, root zone oxygen demand is temperature dependent – the hotter the zone, the higher the rate of respiration and the greater the demand for oxygen.

Talking to crop physiologists, any sudden rise in temperature after floods will be detrimental because the plant will respond by shedding more squares and small bolls to put on vegetative growth. Slow temperature rise for a week or so before high temperatures may allow the plant to hold onto fruits that have already set, before changing to vegetative growth.

Soil water content and porosity are the most important factors controlling the flow of oxygen to the roots. Heavy organic mulches increase water-logging effects because microorganisms in the mulch tend to consume most of the oxygen before the roots have a chance to access it.

Once a soil is waterlogged (or compacted), oxygen diffusion from the surface is blocked. If this condition lasts only a day or two, then root growth will only be slightly reduced. But if it continues for longer, then the roots will lose the ability to absorb nutrients and water. It is cruelly ironic that cotton can die from lack of water in a flood.

What you do from now on depends on what stage your crop had reached at the time of the inundation, how many day degrees you have left in the season for recovery (you’ll need 1020 day degrees from last-effective-square to last-harvestable-boll), and the cotton variety affected (74BRF has shown a tendency to put on bolls much later in the season than other varieties and may therefore show better flood recovery traits).

If conditions allow, then surface cultivation is one of the few tools available to arrest anoxia of a water-logged soil. Cultivation will dry the surface soil and enhance porosity leading to better oxygen diffusion. Growers in the cotton growing rain belt of the USA have often observed a recovery in previously water-logged fields after cultivation. Of course the lighter the tractor used, the less the compaction so you’ll have to trade off compaction risk against root anoxia and manage the practicalities of getting a tractor into muddy fields.

If cultivation is not an option, and you are left with a root system that cannot effectively pull in nutrients or water, foliar supplements may be the only way to nurse the crop through this period. You won’t want to apply too much N so that defoliation becomes a battle for another day, nor so much that too much vegetative regrowth is encouraged. If your crop had reached cut-out, then few nutrients will be available for root regrowth anyway. So expect only very slow recovery of the ability to absorb moisture and nutrients from the soil. Remember, if your yield potential has been reduced, then so has the crop’s need for nutrients.

What about pest management? If new growth and new
squares start appearing on the plant, then this will inevitably attract pests such as aphids, whitefly, green vegetable bug and the like. Late season pests are always something we try to avoid by managing for them from the very first spray of the season (and even before that with seed dressings). Remember, not only crop yields, but lint quality is at risk from pests.

So if you’re going to put on a foliar fertiliser spray, should you include Canopy? Given the new growth and squares are where the pests are likely to congregate, and the new growth and squares are most likely at the top of the plant, then a spray of Canopy could be beneficial. You’ll likely reduce the attractiveness of the new growth to the pests, egg lay and survival of 1st-2nd instar nymphs or larvae and therefore the subsequent pest pressure from key pests.

But a word of caution — an aspect of crop physiology that needs to be kept in mind after a root inundation event, is susceptibility to a phenomenon called photo-oxidation. When intensely sunny, cloudless days return after a prolonged period of grey cloudy ones, the plant may need to reacclimatise to this light. During the low light period, the efficiency of the plant’s light trapping mechanisms increases so that it is absorbing enough light energy to supply its photosynthetic appetite for CO₂ from which to build carbohydrates.

But photosynthesis only uses about two per cent of the photosynthetically active radiation so a lot of energy is stored as heat in the leaf. Evapo-transpiration therefore becomes crucial to cool the leaf. With damaged roots not transferring water at a sufficient rate the leaf may be heated beyond the optimum for photosynthetic efficiency. Sprays that might affect cuticular characteristics of the leaf like light reflectance or light absorbance, such as ECs or spray oils, could lead to even higher leaf temperatures.

So until we know more about these special circumstances, Caltex’s advice is not to apply Canopy until the crop has recovered adequate root function (unless it is used close to defoliation as Canopy is used as a defoliant aid and to help control late pests). Caltex is conducting a raft of field trials again this season to test compatibility of Canopy with foliar applied fertilisers and the results will be known by season’s end.

Further reading:
1. Managing flood damaged crops, Facts on Friday, Jan 2011, CSD.
4. Cotton CRC NUTRipak Waterlogging of cotton

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A COMMON adage is that there are two things in life that are certain – death and taxes. But perhaps there are three – death, taxes and the fact that everyone has to eat. It is tempting to think that this third inevitability means farmers will never be out of a job, but it’s interesting to consider how the nature of the agricultural profession has changed over time, and what this means for those interested in working in the industry.

As those who arrived in Australia in 1788 quickly discovered – and as farmers have been learning ever since – Australia is not always an easy place to grow food and fibre. But despite the difficulties encountered by the early European settlers, Australians have continuously enjoyed an abundance of locally-produced, safe, cheap and high quality food. The efficiencies and advances Australian farmers have made in agricultural production mean that Australia’s 130,000 farmers produce sufficient food for more than 60 million people, and sufficient fibre for many times that number of people.

The methods used to produce food and fibre on Australian farms have changed significantly over time, and with it, what it means to work in agriculture. This is also true of other occupations. You don’t tend to see many telegram deliverymen, petrol station attendants, switchboard operators or chimney-sweeps these days. These are some of the many jobs which have become extinct over time, through the development of new technologies or even new industries.

Farming is an occupation that has survived through the ages, but the work of a farmer today is vastly different to that of farmer in the 19th century. Few people working on farms today can shoe a horse, or sow up a bag of wheat, or work a cross-cut saw, or use an adze to shape a fence post, but these were all important farm skills a little more than 50 years ago. On the other hand, farm workers 50 years ago never had to calibrate a boom spray, read a yield map, download CBOT wheat prices, or analyse the fertiliser needs of a paddock based on soil tests.

Agriculture is an industry which perhaps best demonstrates the impact of technology on the nature of an occupation. Not only has the number of people working directly in agriculture changed, but also the types of jobs, the proximity of these jobs to farms, the level of education required of workers, and the technologies that a farmer relies on.

Analysing what and how productivity changes have been made in the sector may provide clues as to how the sector is going to evolve in the future, and what that will mean for a future career in Australian agriculture.

Productivity – what’s it got to do with work on farms?

In the second half of the 20th century, global population and therefore food demand grew at an unprecedented rate. Yet despite this enormous growth, agricultural production kept pace,
in fact increasing beyond what was required, with the result being that inflation-adjusted food and fibre prices fell significantly over this period. How did this occur? The answer is that productivity gains made in agriculture have a lot to do with it.

Productivity is a measure of the efficiency of the conversion of inputs to outputs. Productivity growth involves increasing output from a given level of inputs, and these inputs include labour.

Over the period from 1975 to 2004, the Australian agriculture sector achieved the second highest rate of productivity growth of any industry sector in the Australian economy. Australian agriculture has achieved productivity growth levels up to four times higher than the average for the economy as a whole.

Much of the productivity growth that has occurred in Australian agriculture over recent decades has been in terms of outputs per unit of labour, which has occurred both as a result of reduced labour inputs, but also due to increases in total outputs.

A consequence of the change has been that the number of farm businesses has declined as it has become possible for the same number of people to manage a bigger area of land – so the number of people employed in the sector has also declined.

Figure 1 shows the change in the number of farms in Australia from 1956–57 to 2007–08. The analysis is somewhat hampered by a change in statistics collection methodology in 2005–06 which produces the sudden jump in the apparent number of agricultural enterprises. But the overall trend is clear – over the past half century the number of farms has decreased significantly.

While there has been an overall decrease in the number of farms, the size and composition of agricultural enterprises over this period has changed dramatically. Farm businesses have been reducing in number, and increasing in size.

**Where do productivity gains come from?**

Necessity is the mother of invention. In no other sector is this more true than Australian agriculture. There are many factors which may influence productivity rates in agriculture. These include seasonal changes, infrastructure, education, communications, transport, farm size, improvements in fertilisers, pesticides, new crop varieties and new livestock technologies. Each of these elements, and others, has changed significantly in Australia over past decades.

A combination of a lack of manpower and demand for food during World Wars I and II placed increasing pressure on agricultural systems. The process of planting and harvesting crops, in particular, was revolutionised with the development of the tractor, combine-harvester, delivery of grain by trucks, and the development of sack-loading devices. These changes were all outcomes of necessity.

Despite these significant developments, until the 1960s and early 70s, productivity gains were not keeping pace with population growth. A big factor in the turnaround was the improvement in plant genetics over this period – the ‘Green Revolution’ – which resulted in more productive plant varieties that responded to improved production practices with increased yields.

The new high-yielding varieties of wheat, maize and rice were introduced commercially into many countries including Australia. This research translated into significant increases in grain production, and coincided with the development of key changes critical to modern agriculture, such as the increased use of pesticides, fertiliser and irrigation.

Increased soil degradation and food shortages in this time also led to a search for sources of elements critical to the growth of plants, including phosphate rock and guano for phosphorous, nitrogen fertiliser produced by synthesising ammonia from atmospheric nitrogen, and sulphur and potassium. The development of mineral fertilisers was a key contributor to increased global crop yields.

In livestock sub-sectors, the past half-century also represented a period of significant changes in practices as a result of improvements in animal breeding, genetics, feeding technologies, and more recently advances in animal disease and animal health management.

Research and development has been a consistent and significant source of productivity growth, contributing to every step of the modernisation process. The rapid emergence of biotechnologies provides an excellent example of the role research and development plays in changing production practices. Modern biotechnology includes the manipulation of whole organisms, groups of cells or cell components. Genetic engineering generally refers to the identification of genes which control particular processes, and the transfer of that gene into another organism. For plants, this opens up major areas for manipulation such as insect resistance or herbicide tolerance.

Genetically engineered crops were made commercially available in 1996, and since then their use globally has expanded significantly. Genetically engineered crop adoption was slowed in Australia due to state government moratoria, but their adoption is now increasing rapidly. As technology continues to evolve more broadly across society, the application of biotechnology in agriculture will inevitably adapt in response.

**The future of agriculture will almost certainly incorporate an increasing level of technological advancement.**

**What does all this have to do with employment?**

Over time, developments such as research-induced technical change, changes in infrastructure, levels of education, communication technology, availability of information and advice, seasonal changes, policy environment, investment levels, and more broadly across society, the application of biotechnology in agriculture will inevitably adapt in response.

**TABLE 1: Estimated employment in agriculture by sub-sector, 2001–02 to 2007–08**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>23.9%</td>
<td>27.0%</td>
<td>28.5%</td>
<td>27.5%</td>
<td>27.4%</td>
<td>27.3%</td>
<td>23.1%</td>
<td>–0.9%</td>
</tr>
<tr>
<td>Grain, sheep and beef cattle farming</td>
<td>52.6%</td>
<td>48.1%</td>
<td>49.0%</td>
<td>44.9%</td>
<td>46.4%</td>
<td>46.0%</td>
<td>49.0%</td>
<td>–3.6%</td>
</tr>
<tr>
<td>Intensive livestock</td>
<td>9.9%</td>
<td>10.6%</td>
<td>8.8%</td>
<td>10.4%</td>
<td>10.6%</td>
<td>9.7%</td>
<td>10.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Other livestock farming</td>
<td>3.0%</td>
<td>3.5%</td>
<td>3.0%</td>
<td>3.5%</td>
<td>3.7%</td>
<td>3.4%</td>
<td>2.8%</td>
<td>–0.3%</td>
</tr>
<tr>
<td>Broadacre cropping</td>
<td>4.2%</td>
<td>3.8%</td>
<td>3.2%</td>
<td>5.4%</td>
<td>3.0%</td>
<td>4.8%</td>
<td>5.3%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Services to agriculture</td>
<td>6.3%</td>
<td>7.0%</td>
<td>7.5%</td>
<td>8.3%</td>
<td>9.0%</td>
<td>8.9%</td>
<td>9.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Total agriculture</td>
<td>372,397</td>
<td>314,670</td>
<td>312,110</td>
<td>303,138</td>
<td>298,675</td>
<td>307,350</td>
<td>305,763</td>
<td>–3.2%</td>
</tr>
</tbody>
</table>

*Percentage may not add up due to rounding.
A career in agriculture has evolved from a mainly physical pursuit to one where highly technical skills and aptitude are required.

openness to trade, and uptake of new technologies – have all combined to influence the way people working in agriculture carry out their daily activities. For each factor that influences the agriculture sector, there is an associated skill-set and a job to go with it.

From the colonisation of Australia through to today, the occupations within, and associated with, the agriculture sector have changed significantly. Table 1 shows a breakdown of employment in agriculture by sub-sector from 2001–02 to 2007–08. It highlights that the sub-sector with the largest percentage increase in employment was ‘services to agriculture’.

At the same time, the number of people employed in the grain, sheep and beef cattle farming sub-sector experienced the largest percentage decrease in employment, with agriculture as a whole experiencing a fall in total employment by 3.2 per cent.

Mechanisation within the agriculture sector had a significant impact on numbers of people working directly on farms, but this benefits the farmer and the consumer by freeing money and time that can then be reinvested in other areas of the business, making it more economically efficient.

While this suggests an overall decline in agricultural employment, it does not give an accurate picture of the nature of the jobs, or demand for employees in agriculture.

Demand for agricultural graduates

A good indicator of the demand for employees in a sector is the demand for graduates. A comparison of this with the number of students graduating from agriculture courses shows that demand for workers in the agriculture sector is very strong.

The Australian Council of Deans of Agriculture estimated that Australian universities were graduating less than 800 graduates per year in agriculture and related courses. Yet the demand for graduates is estimated at more than 6000 per year. According to available data, it is estimated that a labour shortfall of 96,000 full-time workers exists in agriculture.

As Australian farms have become increasingly reliant on technology and innovation for their productivity gains, the need for skilled employees has become increasingly critical. The productivity trends outlined above have influenced the skills and education level demanded for a profession in agriculture, though the demand isn’t currently being met.

The Australian agriculture sector is classified as ‘highly skilled’ under the ANZSCO classification system, with 69.1 per cent of those working in the sector employed in level 1 occupations; that is managers, administrators and professionals. Being able to handle a bullock and cart is no longer the most important prerequisite of working on a farm that produces crops – rather an ability to navigate a GPS system is perhaps more important.

What will a job in agriculture look like in 20 years time?

Technological change will continue influencing Australian agriculture and the nature of jobs in the sector. The dissemination of information via the internet and information technology has already had a dramatic effect on agricultural enterprises, which requires employees to be skilled in a range of different technologies.

As a result of the increasing adoption of new technologies and innovations to achieve productivity gains, the agricultural workforce has had to change. The need for highly trained and skilled personnel has become increasingly critical throughout the supply chain, and the educational requirements of farm workers have increased.

Changing trends in consumer demand will also influence the skills required of an employee in agriculture. The average consumer today is considerably more environmentally aware and retailers are responding to the demand for sustainably-produced foods. This often results in the retailer requiring farmers to meet various quality and environmental standards in order to retain access to the retailers’ shelves. This, in turn, means that farm workers need to be able to understand the requirements of these quality systems, and how records need to be maintained and managed to ensure ongoing accreditation.

Using a wrong chemical, or failing to correctly record management activities, can quickly jeopardise accreditation status and could cost a farm business a large amount of money – so staff need to have good literacy, numeracy and computer skills.

As technological change continues at an ever-increasing rate, it’s increasingly unlikely farmers will be able to keep abreast of every new technology development, market demand or retailer requirement. Consultancy or advisory personnel will therefore become increasingly important to facilitate the technology transfer required to keep farms ahead of the competition – a trend that is evident in the data in Table 1.

The pressure to produce increasing amounts of food of very high quality, but with the lowest environmental footprint will also influence the type of skills required of consultants servicing the farm sector. Skills in areas such as environmental assessment, ability to implement standards, and the development of good record keeping systems will be more important in the future.

It’s clear that as each agricultural production change happened, it not only influenced the productivity of the sector, it also influenced the nature of a job in agriculture. What was a very physical job focused on manual tasks, has diversified into many varied roles which require very different levels of technical aptitude.

A job in agriculture will be less likely to be based on the farm, the level of technical knowledge and education required will continue to increase, and the range of technologies an employee will need to be conversant in will grow.

The increasingly sophisticated nature of the agriculture industry provides a great opportunity for young people looking for a challenging career, and this needs to be highlighted in order to attract new industry entrants to meet the projected future demand for agriculture workers.

2012 Farm Study Tours

For more than 19 years Greenmount Travellers have criss-crossed the globe visiting amazing agricultural, geographical and cultural destinations in China, Russia, South & North Americas, Canada, India, Tibet, Africa, Eastern & Western Europe, Scandinavia, United Kingdom, SE Asia, Japan, The Kimberleys and Nuigini.

We know where to go – and have established excellent farming and agribusiness contacts. We also have valuable experience in dealing with the unique challenges ‘out of the square’ travel presents. This ensures our tours are well organised and are expertly guided by local, trusted operators and our own experienced Greenmount Travel guides.

Express your interest by giving us a call on 07 4659 3555 or email travel@greenmountpress.com.au or visit www.greenmounttravel.com.au
Poor me!

I am in desperate need of sympathy and understanding. Why? Because over the past two weeks my nerves have been totally frazzled and my normal gung-ho cheerful countenance has completely evaporated! I have descended into the depths of despair.

Caring and concerned readers, of which there are possibly one or two, may be wondering what on earth has happened to their favourite tractor scribe. Has his budgie died? Has he been given an assignment in Afghanistan? Has the taxman been pounding on his door?

But no, none of these things. Much worse! I updated my computer!

Certainly this would not have presented a problem to the 10 year old school boy, who lives on a neighbouring property. But to an ageing tractorman, reared in the era of fountain pens and kerosene refrigerators, and long before even the calculator was invented, a computer update can prove a formidable challenge.

The trusty computer I replaced had seen at least seven summers and was therefore the equivalent of a steam driven tractor, in terms of being long past its use-by date. The persuasive young salesman had assured me, with a choir boy innocence, the change-over would be a breeze, “… even for a gentleman of your mature years.” Hmm!

To enumerate here the problems encountered, would I fear be too distressing for me and possibly result in me having to take recourse to a treasured and yet unopened bottle of a rare 20 year old Highland malt, which I have been saving for Scottish Independence Day – should it ever occur.

Instead, please bear with me as I recount how things used to be when first I started scribing tractor articles for magazines. This of course was at a time before computers had even been thought of (what bliss!).

How it all started

During the early 1960s, as a youthful sales manager employed by Lough Equipment Pty. Ltd. located on Sydney’s North Shore, I suggested to my boss, Eric Lough, that we should produce a monthly promotional magazine extolling the virtues of our various lines of machinery. This would be sent out to earthmoving contractors and relevant local, state and federal government departments. My boss agreed, but said I would be shouldered with the responsibility. Great, as if I hadn’t enough to do!

My camera was a 120 twin reflex Japanese Yashika – I couldn’t afford a German Rollieflex! Each month I would trot down to Douglas Baglin’s studio at St.Leonards with a couple of rolls of Kodak Panchromatic film, where he would make glossy black and white prints from the negatives. The subject matter was of course our range of construction machinery, which included Whitlock loader/backhoes, Thwaites diesel dumpers, Hydor tractor compressors, Wylie portable asphalt plants and Greens rollers.

The much worked on text for Equipment News had been progressively and laboriously typed out at home on an ancient portable Smith Carona typewriter, that had once been owned by my grandfather back in Scotland. Due to my inaptitude, much of the time was taken up by making corrections using the dreaded white-out tape.

Then it was off to a house at Forrestville, where a backyard printer had installed an offset printing press in his garage, mainly for church work. He produced our little glossy magazine, complete with coloured cover, for a fraction of the cost quoted by ‘legitimate’ printers – providing he was remunerated in cash!

But it worked! I frequently received phone calls from contractors or government engineers, wishing to obtain more information about a machine they had seen in Equipment News. Sales flourished.

A few years later, in the position of Australasian Marketing Manager for Conquip Ltd, I edited a similar but more sophisticated publication, this time entitled Equipment Digest.

The Earthmover

Fast forward a few years into the 1970s, and I was the proprietor of Ian M. Johnston Pty Ltd dealers in new and used earthmoving machinery, with premises located at Rydalmere, a Sydney industrial suburb. I was also an active member of The NSW Earthmovers and Contractors Association, an exalted body...
that also published an excellent technical magazine entitled *The Earthmover*.

Upon reflection, it must have been towards the end of one of the association’s opprobrious hearty social events, or perhaps at one of the frequent aftermath educational visitations to a Kings Cross tavern where, in my benevolent and munificent state of mind, I humbly agreed to accepting the position of Technical Editor of *The Earthmover*.

In actual fact it proved to be a great decision. My priorities were obviously aimed at the demanding task of managing Ian M. Johnston Pty Ltd But I had surrounded myself with an enthusiastic and experienced staff who excelled when given responsibilities. Accordingly I enjoyed performing the tasks of a Technical Editor. It was a sort of escapism from my routine work schedule.

Each month I was presented with a newly introduced item of earthmoving plant for me to photograph and carry out a performance test of its capabilities – a sort of road test. The dealer was responsible for transporting the unit to a vacant work site, where it was handed over to me for a couple of days to do as I wished. The machinery ranged from track type excavators to wheel loaders, from bulldozers to dumpers and everything in between.

Usually a concerned marketing type would appear on the scene, anxious to determine if I would be giving the machine a thumbs-up review in the magazine.

**The Terex**

I recollect with amusement the occasion I tested a Terex 72-11 wheel loader, one of the products offered by Blackwood Hodge Ltd. An area at the rear of the firm’s premises had been set aside for me to put the big machine through its paces.

Towards lunch time I was astonished to see the Managing Director, whose name was Friar Tuck (yes really), picking his way through the sticky mud in order to shake my hand. This was followed by an invitation to join him and his senior staff for lunch in the formal executive dining room – no less!

Well, that was an experience! During the meal, served on fine Royal Dalton china, accompanied by rare vintage wines dancing in exquisite Stuart crystal goblets, I realised that some well planned persuasive psychology was in process. I was surrounded by highly paid executives who were willing me to write a glowing report about their new Terex loader.

But they need not have worried. A pie and tomato sauce would have resulted in the same outcome. The Terex could not be faulted. But I certainly had an insight into the grandiose life style enjoyed in a colonial outpost of a traditional British company.

**The Fiat**

Fiat Australia introduced the FL10 track loader into its range of earthmovers in the early 1970s. I donned my white overalls and proceeded with the test.

Being a conscientious sort of bloke, I first went to dip the oil prior to firing up the engine. This is of course a routine procedure, normally carried out by any plant operator worth his salt. I was shocked to discover that it was impossible to reach the dipstick without first having to start the engine in order to raise the loader arms to provide access to the dip stick!

I highlighted this appalling oversight in the ensuing article in *The Earthmover*.

And didn’t that create a furore! Reverberations all the way...
back to Italy. I later learned the backroom technical boffins had been severely chastised by management and a rapid redesign implemented.

The bad and the good

I flew down to Melbourne to inspect and test the latest Cranvel backhoe. Never before or since have I ever struck a more complicated, indeed obscene, tangle of hydraulic valve spools, check valves, control valves and hoses. I got the impression that some deranged simpleton had designed the system. The result resembled something which a Chinese noodle chef might have discarded out of his back door! (See photo)

The excuse for this monstrosity was that the designer had endeavoured to produce an off-set digger by incorporating not one but two slew posts, thus negating the necessity of a...
side shift frame. Quite extraordinary, but I guess it is a case of whatever turns you on!

One of the most impressive machines I tested was a six-wheel drive Volvo dumper. This was the first of a long line of heavy duty articulated dumpers to emerge from the Swedish manufacturer.

The test site was an abandoned quarry where it had not stopped raining for several weeks. The bottom of the quarry resembled a vast cauldron of Auchtermuchty porridge! Certainly to my amazement, with 20 tonnes of dirt on board, the big dumper effortlessly waddled its way through the mire with its six wheels almost completely submerged.

**In conclusion**

It is interesting to contemplate that my earlier journalistic activities were performed without the use of digital cameras, computers or even fax machines. Our Google was World Book Encyclopedia. Even word processors had not been invented. If we had an electric typewriter with a golf ball thingo, we thought we were made.

I have to confess there is no question that digital cameras and computers have advanced the technical aspects of journalism to heights never before imagined.

**So where do I fit in to all this?**

Well, all this reminiscing during the writing of this epistle (using the new replacement computer) has obviously worked as a tonic. I am now out of my melancholy state and am wondering why I had sunk to such depths of despair. Must have been the haggis I had for dinner last night!

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**IAN’S MYSTERY TRACTOR QUIZ**

**Question:** Can you identify the tractor from this rear view?

**Clue:** It is not a Grey Fergy.

**Degree of difficulty:** It is even beyond the scope of our illustrious Editor!

**Answer:** See page 56.
This edition of Germinating Ideas will address the issues that affect cotton yields and some of the management practices to assist in producing high yielding crops.

Soil management

Years like this one are probably a one in 20 year event with high price and good allocations of irrigation water across all growing regions, most growers will plant a considerable area of their properties to cotton. In these seasons we see a wide range of soils and associated problems rear their head. In saying that growers are usually aware of the issues associated with these fields but feel due to the high price, they still have the opportunity to profit from these fields.

Some of the soil issues are:

- High sodicity soils with poor structure, that are hard setting and have high sodium levels;
- Fusarium fields with moderate levels of FOV inoculum;
- Poor structural and sandy soils with poor water holding capacity that leach nutrients;
- Compacted soils through heavy traffic over many years.

The impact of poorer soils is hard to quantify but in general knowing what the issue is with the fields allows flexibility in terms of crop management. Some examples of how management can influence poorer soils are:

- The use of gypsum on high sodic soils either pre-planting or as liquid injection at planting;
- The use of a high FRank varieties on FOV soils; and,
- The incorporation of a green manure crop for organic matter and nutrition in poor structural soils with poor water holding capacity.

Irrigation management

Irrigation timing is critical, particularly in crops that have good retentions and strong boll loads like many in NSW and Queensland this season. Furthermore, in some NSW fields this season with a cool start occurring, crop vegetative growth was poor before Christmas — with high fruit retention some crops have started flowering at six nodes above white flower. In these situations it is very important that irrigations are not delayed for any reason as further stress can lead to premature cut-out.

Full maintenance programs of pumps, gates and channels and storages is important to prevent break downs or delays in getting water to fields. The affects of water stress through crop development is well documented.

Figure 1 shows yield reductions resulting per day of stress for different growth stages. It clearly shows that water stress during peak flowering can double yield losses compared to early or late seasonal stresses. The impact of any one stress period is increased if followed by further stresses.

Further, in situations where crops have high fruit retention, particularly Bollgard II crops, there may be more competition for crop assimilates between cotton roots and bolls and leaves, especially lower leaves. With high fruit retention and rapid boll set there is a possibility that root growth may be reduced in comparison to lower retention crops as can be seen in Figure 2.

With this is mind there may be a need to reduce irrigation deficits and bring irrigations forward, particularly under high evaporative demand and on lighter soils.

To manage for high yield it is critical that the crop has water when it is required. Any stress on the crop by stretching or missing an irrigation directly affects yield. Correct monitoring of crop water use and irrigation efficiency will help determine...
What does best practice look like?

myBMP is the new Australian cotton industry best practice initiative which has been redesigned from the ground up to provide every grower with the latest information.

Backed by industry, myBMP is the everyday online resource that is proven and easy to use. From the first time online, every grower can start a confidential selfassessment to see where the farm’s practices line up with industry’s best.

You can work in your own space at any time and confidently plan for self-paced improvement across your business. And when you’re ready, if you choose to, you can always take the next step anytime to have your enterprise certified as Industry Best Practice.

You will find that every aspect of production has the industry’s best practices detailed – each module has direct links to the latest R&D information that can help your business.

Industry backs myBMP with a range of support systems including phone and face to face training; or if you prefer, many agronomists and farm supply businesses are now accredited to take you through each step along the way.

myBMP: It is ready when you are.
irrigation requirements in high retention crops. Water monitoring in conjunction with crop monitoring can help understand how the crop is using water. Tools such as the Crop Development Tool available on the Cotton CRC website — tracking squaring nodes, bolls and monitoring Nodes above white flower (NAWF) — can also be very useful in getting it right with water management.

**Nutrition**

Crop nutrition is vitally important in producing good yields. Cotton has a high demand for nitrogen and to obtain the highest yields possible nitrogen must be applied and accessible to the crop.

High yielding crops can use large amounts of nitrogen. The only risk associated with placing large quantities of nitrogen is whether it is accessible and utilised by the crop. In some circumstances the crop, due to the seasonal conditions, will not uptake all the nitrogen leaving a nitrogen bulge in the profile that can cause issues at defoliation with regrowth and also insects. But it may be a benefit for the following wheat crops.

Potassium is another main nutrient that has a strong relationship with boll development. Signs of this nutrient being limited are seen as premature senescence. There are a range of Potassium fertilisers that are available; the key is to make sure that crops have enough potassium particularly with heavy fruit loads.

**Insects**

Retention levels need to be high to develop high yielding crops. The more fruiting sites and bolls on a plant the more potential yield as seen in Figure 3. Hence insect monitoring and control when required is important. This is especially crucial in short growing regions where the loss of fruit is difficult to regain due to the reduced season length and risk of developing bolls in the cooler autumn months reducing micronaire and the potential to delay harvest.

This season has seen low insect pressure across many growing regions for various pest species. This has enabled crops to develop very strong boll loads and high yield potential.

**Variety selection**

**TABLE 1: Water required for four bales/acre and seven bales/acre crops**

<table>
<thead>
<tr>
<th></th>
<th>4 bales/acre</th>
<th>7 bales/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water used (ML)</td>
<td>1.25 b/ML</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>2.0 b/ML</td>
<td>13.9</td>
</tr>
<tr>
<td>Irrigation required</td>
<td>1.25 b/ML</td>
<td>4.9</td>
</tr>
<tr>
<td>1 ML in soil</td>
<td>2.0 b/ML</td>
<td>10.9</td>
</tr>
<tr>
<td>Water pumped</td>
<td>1.25 b/ML</td>
<td>6.6</td>
</tr>
<tr>
<td>75% irrigation efficiency</td>
<td>2.0 b/ML</td>
<td>14.5</td>
</tr>
<tr>
<td>(Constable and Bange 2006)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 2: Nitrogen update of four bales/acre and seven bales/acre crops**

<table>
<thead>
<tr>
<th></th>
<th>4 bales/acre</th>
<th>7 bales/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen uptake (kg/ha)</td>
<td>12kgN/bale</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>10kgN/bale</td>
<td>165</td>
</tr>
<tr>
<td>Nitrogen removal (kg/ha)</td>
<td>12kgN/bale</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>10kgN/bale</td>
<td>100</td>
</tr>
<tr>
<td>(Constable and Bange 2006)</td>
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</tbody>
</table>

Growing varieties with high grams per boll weight also contributes to higher yields.

Figure 4 shows the difference in boll weights for CSD commercial varieties.

When high boll number is combined with high grams per boll, strong yields are generally seen. Of course there is one major hurdle and that is the climate. Rainfall such as that seen over the past two seasons, has major impacts on yield and the same could be said of years where temperatures are over 40°C for long periods of time.

**Conclusions**

The issues that are associated with poor yields are also associated with producing high yields in that having the right soil type, good timing of irrigation and water available, good nutrition and good insect management determines the overall yields in cotton.
Man or plant? Finding the best users of light energy

By Sharon Durham, Agricultural Research Service – USDA

WHEN it comes to using light energy, how do manmade photo cells compare to plants’ photosynthesis? An Agricultural Research Service scientist participated in a study comparing how efficiently plants and photovoltaic cells convert sunlight into energy. The study, published in Science, could help researchers improve plant photosynthesis – a critical first link in the global supply chain for food, feed, fibre, and bioenergy production.

Comparing the two systems is a challenge. Although both processes harvest energy from sunlight, they use that energy in different ways. Plants convert the sun’s energy into chemical energy, whereas solar cells produce electricity.

Scientists know that plants are not as efficient as manmade solar cells at converting light into energy, according to research leader Donald Ort in the ARS Global Change and Photosynthesis Research Unit in Urbana, Illinois. “But now we have a way of comparing the two systems more accurately,” he said. The study identified specific redesigns that hold excellent promise for improving efficiency.

To facilitate direct comparison between photosynthetic and solar cell systems, the researchers set a uniform basis for the comparison and examined the major factors that define the efficiencies of both processes – first considering current technology, then looking forward to possible strategies for improvements.

In all cases, the research team considered the efficiency of harvesting the entire solar spectrum as a basis for comparison. Additionally, the researchers compared plants to solar cell arrays that also store energy in chemical bonds.

Calculations were applied to a solar cell array that was coupled to an electrolyser that used electricity from the array to split water into hydrogen and oxygen. The free energy needed to split water is essentially the same as that needed for photosynthesis or a solar cell, so the comparison is on a level playing field.

Potential to improve nature

Using this type of calculation, the annual averaged efficiency of solar cell-driven electrolysis is about 10 per cent. Solar energy conversion efficiencies for crop plants are about one per cent, which illustrates the significant potential to improve the efficiency of the natural system.

“While, in the context of our efficiency analysis, solar cells have a clear advantage compared to photosynthesis, there is a need to apply both in the service of sustainable energy conversion for the future,” says Don. “Our ultimate goal is to design food and biofuel crops that use sunlight energy more efficiently and are thus higher yielding. This energy-efficiency analysis between plant photosynthesis and solar cells will lay the groundwork for improving the efficiency of plant photosynthesis in agriculture for improved yield.”

Donald Ort is in the USDA-ARS Global Change and Photosynthesis Research Unit, 1206 West Gregory Dr., 1500 IGB, Urbana, IL 61801; PH: +1 (217) 333 2093.

In studies at Urbana, Illinois, ARS scientists (left to right) Carl Bernacchi, Don Ort, and Lisa Ainsworth work in a facility where photosynthesis efficiency and yield can be measured in response to a simulated variable. Improving photosynthesis could lead to increased food production from soybeans, shown here. (Photo courtesy of Institute for Genomic Biology/University of Illinois.)

Research leader Don Ort inspects a switch for a device that allows him to adjust a variable in the soybean field. (Photo courtesy of Institute for Genomic Biology/University of Illinois.)
Cotton grower set for success with new tractor

WITH above average cotton prices last year and this year’s prices looking promising, New South Wales farmer Graham Cook took the opportunity to upgrade his equipment recently, choosing an all-new Case IH Magnum 340.

Graham grows 480 hectares of irrigated cotton on a 1785-hectare property 15 km south east of Goondiwindi, and a mix of forage oats, barley and dry land sorghum on a 1,200-hectare leased block nearby.

“We’ve gone through a lot in the last few years including low market prices followed by the January floods,” said Graham. “The flood was the biggest in history, but our crop was saved by a late break giving us time to recover. Yields were around 10 bales per hectare last season, with market prices up around $900 a bale. This year we’re looking at around 12 bales a hectare with prices at $500 per bale, which is still pretty good for our industry.”

The recovery in the cotton industry comes as a welcome break for Graham, who moved out of cotton entirely seven years ago when prices dropped to $400 per bale.

“We got back into cotton two years ago, so it’s the ideal time to take advantage of the market upswing and invest in our equipment.”

To date, the Magnum 340 has done 350 hours in field, predominantly spraying and ripping the country prior to planting.

“We chose the 340 because it’s the largest front-wheel assist model in the Magnum range,” explained Graham. “Having the front wheel assist makes it easy to run down the rows. On top of this, the AutoSteer technology helps to keep our implements straight for improved efficiency.”

The Magnum 340 is part of a completely new range of Magnum and Steiger tractors recently launched by Case IH. With five new Magnum models on offer and six new Steigers, the range delivers more than just a facelift and is more than 60 per cent new.

All five new Magnums, which range from 235Hp for the Magnum 235 to 340hp for the range-topping 340 model, have more power than their predecessors. For the first time they also include a ‘power boost’ feature as standard, which delivers 37 additional hp, to enhance performance as much as 14 per cent.

Meanwhile, the hydraulic system operates at a flow capacity of 224 litres per minute with the rear linkage offering max lift capacity of 10,200 kg. The Magnum’s performance is topped off by a new front linkage with up to 5000 kg lift capacity and a front PTO option.

“It has the ability to easily rip at least 50 to 75 mm deeper in the one pass than our previous machine, an older model 8950. This deeper penetration affords greater protection against pests and weeds in the soil bed,” explained Graham.

“It’s also incredibly fuel efficient, while delivering greater horsepower. I estimate we’re saving at least half a litre of fuel per hectare, which is a big cost saving across the operation.”

The Magnum puts key functions at the operator’s fingertips with its Multicontroller armrest and service intervals have been extended to 600 hours.

“Its ease of use really appealed to us in the current climate of labour shortages,” added Graham. “It really has taken the business to a new level of efficiency.”
Record number of arbitrations at the ICA

In 2011, the International Cotton Association (ICA) received 242 requests for technical arbitration – over five times its normal yearly average and more than double the Association’s prior record high of 2008.

In the first two weeks of 2012, the ICA has received eight requests for arbitration. This situation not only demonstrates the stress placed on the cotton supply chain and the performance of contracts, but it also highlights the role of the ICA and the importance of taking consistent and positive action towards promoting contract sanctity and a safer trading environment.

Antonio Esteve, ICA President explains: “The ICA’s major guiding principle is the fulfilment of contracts. Being an ICA member means that you believe in upholding contract sanctity. By trading with other ICA members you know that your counterparties also support this principle. Last year we introduced a more inclusive membership structure to attract members from all links in the supply chain, from all over the world. This has been a success with membership up by 34 per cent. .”

The majority of the world’s cotton is traded under ICA Bylaws and Rules. If a company fails to honour an arbitration award brought against them, they will be placed on the “ICA Default List.” Defaulters’ names are posted and circulated across the cotton community so that they are marginalised from the normal course of business. ICA members are not allowed to trade with counterparties on the default list and, if members do not fulfil their contractual obligations, they face being expelled from the Association.

Auscott scholarship winners

OREE Secondary College student, Tamsin Quirk, has been awarded the $45,000 Auscott Scholarship for the Gwydir Valley for 2012.

Tamsin joins other Auscott Scholarship winners from the Namoi and Macquarie Valleys.

She plans to attend The University of New England, where she will study for a Bachelor of Agriculture degree over three years.

The award follows an interview process which was undertaken in late 2011. The interview panel, made up of Education Department and Auscott representatives, was impressed by the high standard of the applicants from the area.

In 2012, Auscott will be supporting 10 carry-over students as well as three new students from the Gwydir, Namoi and Macquarie Irrigation areas. Auscott’s investment in the scholarships is currently running at around $130,000 annually. Each scholarship contributes towards living expenses, books and course fees up to $11,500 per year.

Since the commencement of the Moree Award in 1980, 31 awards have been made to students from the Moree district.

In the Namoi, Katie Brooks of Narrabri High School is the 46th recipient from the Narrabri Shire to be awarded the Auscott Education Program Scholarship. Katie was chosen from 14 applicants from the Narrabri and Wee Waa High Schools. Her history of achievement and community involvement includes scholarship, citizenship and sporting participation. She has attained awards in public speaking, debating and writing as well as performing her duties as the Girl’s School Captain.

Katie will be attending the University of Newcastle where she will study Bachelor of Business/Bachelor of Laws.
Rotary youth in Cotton Camp 2012

The Rotary Clubs of Moree and Moree on Gwydir’s annual Rotary Youth in Cotton Camp is scheduled to take place in May again this year. It is a fantastic opportunity for Year 10 and 11 students from Rotary District 9650 to experience first-hand, the amazing and dynamic cotton industry in the Gwydir.

The camp is held over four days, based out of Moree, in which time participants will visit a multitude of cotton production environments, including farming properties and gins to interact with people in the many and varied roles within the industry, whether it be agronomy, marketing, machinery operation and maintenance or irrigating to list a few.

By enlightening young people on the array of employment opportunities available within cotton, the initiative aims to encourage more people to strengthen the workforce, supporting one of the predominant and developing industries of the Moree district. It is also a great chance for people who would otherwise not be involved in the industry to gain an understanding of the processes required to take cotton through from the paddock to retail. Even participants who have had reasonable exposure to the cotton industry have in the past learnt something new through the camp.

The Rotary Youth in Cotton camp is also a great way to network with other young people who share an interest in agriculture and potential future employers and colleagues.

Previous camp participants have said:

“The camp was a great way to learn and extend my knowledge about cotton and farming in general. I think everyone saw something new and interesting, as well as having loads of fun...” – Casey.

“The camp taught me a lot about country life, cotton and farming. Although I was the only student from the coast, everyone made me feel really welcome and all other students explained the things I had never seen before...” – Dean.

Anyone wishing to attend the Rotary Youth in Cotton Camp for 2012 is encouraged to register their interest by contacting the Moree Rotary Club.

Contact: Tim Lyne, Ph: 0428 657 174, Email: tim.moree@raywhite.com

2012 Australian Cotton Industry Awards lead to Gold (Coast)

Winners in the 2012 Australian Cotton Industry Awards will be toasting their success on the Gold Coast later this year, during a gala presentation held as part of the Australian Cotton Conference.

The Australian Cotton Industry Awards will be a highlight event during Australian Year of the Farmer, celebrating the contributions of our cotton farmers and researchers to their regional communities and the nation.

Entries for the awards opened recently, with anyone able to nominate themselves or someone else in the cotton industry they think is worthy of this very special recognition.

Categories for the 2012 Awards include the Chris Lehmann Trust Young Achiever of the Year, sponsored by Bayer CropScience, Cotton Seed Distributors Researcher of the Year, Monsanto Grower of the Year, AgriRisk High Achiever of the Year and the Cotton Australia Service to Industry Award.

The low-doc nomination system, introduced for the first time last year, was so successful that this approach is being repeated in 2012. Applications simply require some very basic details about the person being nominated and can be made on the official Australia Cotton Industry Awards entry form.

Entry forms have been mailed to all growers and industry partners as well as being available for download from the Cotton Australia website, www.cottonaustralia.com.au.


Winner of the 2011 Cotton Grower of the Year Award was the team from Bullamon Plains. This year’s Awards will be presented at the Cotton Conference at the Gold Coast.
St George and Dirranbandi

As with many other areas in Southern Queensland the Lower Balonne region was on edge after the continuous rain during November and December. But the end result was a minor flood which has once again topped up storages to finish off this season and allow for another two full seasons ahead.

The 2011–12 season has followed the same path as last year with a very wet November and December and so far up until the past week a dry January. This dry weather was much needed and has allowed the crop to recover from the earlier waterlogging event. The crops are now establishing a decent fruit load with yields looking promising although I would expect overall averages to be slightly down from last year. This is mainly due to the fact that 95 per cent of both the St George and Dirranbandi areas are back to back compared to only 10,000 hectares which was back to back during the 2010–11 season.

Insect activity this season has been low with most growers having applied one spray to date and a few fields being treated for the second time for both mirids and mites. Beneficials have maintained their presence throughout the season so far. Heliothis have been present throughout crops though not at the same levels experienced the past season.

Due to the cooler summer and the extended wet, drizzly weather in November and December, whitefly have been quiet to date although there are numbers building in the lower canopy of the crop. Nymphs are only just beginning to become prominent in the upper canopy of the crop during the past 10 days. The current cool weather should further impact on the number of generations able to develop before defoliation.

A few dry months would be a great way to finish off the season but with the first real cyclone for summer only just brewing in the Gulf and forecasters suggesting a late La Niña we could be headed for an interesting picking season. At this stage the crops in St George and Dirranbandi will be later than the past couple of years with picking expected to start in earnest around the first week of April.

Dallas King
January 26, 2012

Flood update

Well as I’m sure you have all heard from the media reports we haven’t ended up with a few dry months but rather, as with Moree, Mungindi and Dirranbandi, we were on the end of over 200mm of rain during the last 10 days of January. This rain combined with over 300mm in the catchment has meant that the Lower Balonne has now experienced record breaking floods which peaked at 14 metres in St George with the peak of over five metres hitting Dirranbandi.

During the past two years’ flood events, farm levees have managed to keep the flood waters at bay — unfortunately this was not be case with this record flood. While growers and staff have worked around the clock we have had approximately between 4000 to 5000 hectares inundated and more than likely destroyed by the flood waters. There has also been damaged caused to fields which had rain water sitting in them for up to three days though these will continue on to yield something at least. The nervous wait now begins for growers in the Dirranbandi region with the peak to hit the majority of cotton properties within the next five days. We wish everyone who has suffered any loss all the very best for the next few weeks of clean up.

Here’s hoping for a dry pick!

Border Rivers

The variability this season is keeping cotton growers and cotton plants guessing what’s going to happen next.

Following the hot, dry four-week period from late October til late November was a wet, mild four-week period which netted Goondiwindi about 300 mm of rain although there were bigger totals around the district. There was widespread waterlogging of irrigated and dryland crops and a lot of foliar nitrogen was applied during this time. Some dryland crops were destroyed by flood water and inundation, particularly on the floodplains of the Whalan Creek, the Macintyre River and the Callaingon Creek. Generally, crops during this time developed a very surface-orientated and lazy root system which did not serve them well for the early part of January.

From just after Christmas to mid-January was another hot, dry spell and the first opportunity for growers to do any field-based operations for over a month. There was a major challenge, completing necessary cultivations, side-dressing, lay-bys and then all crops needed irrigating at the same time. As a result, many crops ran hot and started to wilt and cut-out.

Just as everyone was catching up with the irrigation, on January 14, most of the district received 50-200mm overnight which caused major problems on some farms. The last two weeks of January was miserable weather for flowering cotton with very little blue sky and frequent rainfall. Fortunately, most of the district dodged the big falls experienced to our northwest during this period but there was a lot of fruit shedding. The sun came out again in the first week of February and at present we are hoping for a couple of sunny weeks to allow crops to compensate for the lost bolls.

The wet periods during the season, particularly November/December has helped produce some of the highest Fusarium and Verticuillium Wilt levels seen for some time. In some fields, particularly with a legume history, there have been very high levels of Sclerotonia which is rotting lower fruit and in some cases, killing plants.

The low insect pressure has been a real plus this season and has been a major part of the early high fruit retentions on crops. Mirids have been present but generally at low levels. There have been some green vegetable bug appear from late January onwards – particularly towards the eastern end of the valley. Cluster caterpillar are quite common and broad mite numbers increased rapidly in early February. Aphids and whitefly are there but not nowhere near problematic levels.

As you would expect with a climatically variable season, the crops are variable also. In most cases, the earlier planted crops handled the early December waterlogging better than later crops and look better now as a consequence. Many of the crops that suffered badly from the waterlogging have responded very well to the addition of some extra nitrogen and improved growing conditions and should make a good recovery. Fruit retentions in most crops is generally excellent and boll sizes look good also.

With the exception of areas that have been inundated,
**District Reports...**

Dryland crops look to have great potential. In mid-January most have a very strong early fruit load and a full moisture profile under them which is a good place to be.

As you would expect with a climatically variable season, the crops are variable also. In most cases, the earlier planted crops handled the early December waterlogging and the late January cloud better than later crops and look better now as a consequence. Many of the crops that suffered badly from the waterlogging have responded very well to the addition of some extra nitrogen and improved growing conditions and should make a good recovery. Fruit retentions in most crops were generally excellent before the poor weather at the end of January but most crops have enough squares to allow some compensation. This will definitely delay the maturity of the crop – whether there will be a yield impact is yet to be seen. No doubt this season has a few more curve-balls for us yet.

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**Darling Downs**

The relatively good start to the 2011–12 season has continued across most of the Downs. In stark contrast to last year, this season has been relatively normal with seasonal day degree accumulation very close to average. December and January were drier than expected and the predicted rain in late January didn’t deliver. Isolated areas receive useful rain but most areas missed out. Dryland crops are starting to struggle and will require rain in the next couple of weeks. Cloudy weather over this period has had some impact on the crop, particularly in the southern areas where there has been some losses of small flowers.

Most of the crops are somewhere between 16 to 22 nodes with a 90-95 per cent fruit retention and as general rule are looking very good. Many of the dryland crops are at four nodes above white flower and are cutting out. The irrigated crops were a bit more varied and not quite as advanced. They are mostly between four to six nodes above white flower and still had a bit more development to go.

Pest pressure continues to remain low although mirids, white fly and green vegetable bug numbers are starting to increase. Cotton bunched top has been reported in ratoon and regrowth cotton and continues to be a concern among growers.

Maintaining good farm hygiene and controlling regrowth and volunteers will play a critical role in preventing this disease from spreading into crops.

One concern is the level of Fusarium in crops. Good growing conditions have masked the disease and the extent of the problem isn’t really known at this point. Cool cloudy weather in early February and the pressure of a large developing crop has allowed the disease to start to express itself. There is some concern that levels could be higher than last season.

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**Gwydir Valley**

Recovery from the inundation in the months of December and January has been quite good. This is not to say that everything is rosy, every farm has its problem field or two. But compared to my thoughts in the last report the crop has come along in leaps and bounds.

This recovery process has happened at various speeds depending on the type and length of inundation as well as the stage of the crop at that time. The best of the crop is looking very good, with high retentions and boll loads, with the earliest planted of these crops approaching cut out in the next couple of weeks. There are other fields which are sluggish and have yet to fully recover and grow at a normal rate.

Irrigation and nutrition are two areas on which the consultants and growers of the Gwydir are focusing acutely at present. Pushing the good crops to try and achieve high yield potential as well as nursing other crops which are below average. In some scenarios the NAWF have moved too close to the top of the plant for comfort and many are battling these crops within an irrigation cycle to prolong the flowering period for as long as possible.

Temperature regimes are quite livable at present, but some crops need more heat units to hurry them on a bit. Rarely has the maximum temperature been into the high thirties and the minimum temperatures drops to about or below 20°C each night. Not only has this meant that the crop is behind, approximately two weeks on average conditions, but also it is quite noticeable the amount of disease present in fields, especially Verticillium wilt.

In the dryland, the situation is better than first thought as thorough assessment has been made once the flood waters had finally receded. The hardiness of the cotton plant has shone through, with areas thought to be totally destroyed still hanging on, although severely affected. Many crops throughout the district have sections of various maturities, ranging from squaring through to cotton approaching cut out. This will make management from here until defoliation and picking very difficult indeed.

Those dryland areas unaffected by flood water look extremely good. Showers forecast in the coming weeks will assist in producing above average dryland yields in these crops, but will also make irrigation scheduling difficult. For many crops, another prolonged waterlogging event may finish them up prematurely.

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**Flood update**

A major rainfall event which centred itself across the entire valley for the best part of eight days has caused a significant downgrade to the prospects of the Gwydir Valley cotton crop. Rainfall totals ranging from nine to 13 inches were recorded which brought with it associated flooding. The southern portion of the valley has taken the brunt of the flood with an exceptional amount of local water from the Tycannah and Gurley creeks meeting with water coming down the Mehire system.

On-farm damage of irrigated crops is quite varied across the valley, with the most fortunate growers losing yield potential due to a significant fruit shed due to the wet, cool and cloudy weather. Others have had water over-top levees and inundate fields for extended periods. Damage ranges from crops which are salvageable to total write-offs, depending on depth and length of time under water.

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**David Kelly**  
Updated February 10, 2012

**James Quinn**  
January 24, 2012

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**Duncan Weir**  
February 5, 2012
For many there is going to be significant infrastructure repairs to roads, levees, channels and head ditches which will be hastily completed to allow for irrigation in the second week of February.

The dryland scenario is still up in the air. Many areas which were affected by the flood in November, were once again inundated by this event. Physically getting to dryland fields has been difficult with infrastructure damage and swollen creeks and fields making inspection near impossible. Those areas which were high and dry will benefit greatly from this rainfall, and it is hoped that the majority of the inundation is focused on areas previously affected in the 2011 flooding event which will minimise the impact on growers.

Namoi Valley

What happened to global warming? Crops in the Namoi continue to shiver and experience a combination of cool wet weather. We have even had a few cold shock nights in January!

Although most irrigated crops have handled the big wet well many dryland crops have not recovered from months of waterlogging. In general crops are running about two weeks behind schedule but I expect the very high fruit numbers that are being carried will bring the maturity forward over the next few weeks. The high fruit retention is also driving some crops toward early cut out, and growers are trying to get crops moving with extra nitrogen and shorter watering intervals.

There are some excellent crops in the western half of the valley, but the eastern crops can best be described as ‘generally average’ at this stage. Crops in the far upper Namoi were only beginning to flower in mid January and will need an indian summer to finish well.

The most advanced irrigated crops are now carrying up to 350 squares and bolls per metre. The majority of crops are running at over 90 per cent retention. We will need a lot of sunshine over the next month to hold this fruit load. The best dryland crops I have seen are the early planted crops in the western area part of the valley, and a few crops east of Narrabri on red soil. A soft finish will see these crops make very good yields.

Overall insect pressure has been the lowest I can remember. We have only had a few minor egg lays over the past few weeks. Unsprayed cotton refuges have very little damage and are often the best cotton on farm. Sucking pest numbers have declined since November. Whiteflies are now present at low levels but are unlikely to be a problem this year.

Light 2,4-D damage is now evident in some crops following extensive fallow spraying operations throughout the valley.

There has been quite a lot of verticillium evident in crops this season. Lower than average temperatures during late December and early January have encouraged the disease. I expect quite a few crops will be showing severe symptoms later in the season if the weather turns cool.

Water supply continues to improve. Crops have had two to three irrigations on quite low deficits, and have not used much water so far. Keepit remains at near 100 per cent capacity and Split Rock is now at almost 50 per cent. Next year’s water supply is assured.

Overall the crop in the Namoi is looking good but some fine warm weather is required through February and March to set up the crops for above average yields.

Robert Eveleigh
January 29, 2012

Macquarie Valley

It has been a very mild season so far in the Macquarie Valley. Some warm weather post Christmas into early January has been the only real heat to speak of. The nights have been cooler than usual for most of the summer so far and a temperature of 5.8° was recorded in Dubbo on January 12, 2012. This is the lowest recorded temperature for January in the region for over 100 years.

Humid and cloudy conditions have been prevalent for the past week or so and this is delaying crop maturity. Insect pressure has been light so far but mirid numbers have been increasing. Many crops have been treated for sucking pests. In the Narrimine area cotton crops are slightly behind average due to milder temperatures and less day degrees. Cotton in the Warren area is close to average maturity with many crops now cut out.

Where crops are still approaching maturity cut out applications of plant growth regulators are being applied as the desired numbers of fruiting branches are achieved.

Burrendong Dam is down to 79 per cent of capacity. The river has been flowing well for the past month or two. General security allocation has increased to 42 per cent with access to carry over.

A successful cotton insect identification day was held at Warren recently with a good attendance of interested people.

Another fish release was held done on January 16 at Narrimine, Trangie and downstream to release more native fish back into the system. There have been many reports of improving results for recreational fishers in the Macquarie River which is pleasing. These fish releases are funded by the local shire councils and the Macquarie Cotton Growers Association.

Cotton growers are now wanting warm temperatures and clear skies to help finish this season’s crop off.

Craig McDonald
January 30, 2012

Flood update

Despite a major flood in the Namoi, the overall level of damage from the flood itself has not been as severe as first feared. A few crops in floodways have gone and some levees have failed, but the biggest effect has been from the prolonged period of wet cloudy weather. A lot of fruit was shed and the yield potential of the crop has been reduced.

Many growers were looking at one of their best ever crops. But in some cases, the wet weather has reduced yield potential in irrigated crops from over 4.0 bales per acre to 3.5 bales per acre.

Some of the short season areas in the Upper Namoi were not as seriously affected. Many of these crops look very good, but they are very late after a cool season and are reliant on an excellent finish to the season to realise their full yield potential.

Dryland crops overall handled the wet weather and flooding fairly well, despite some losses. The crops that are still there have excellent yield potential.
from the recent rain event. Up to 100 mm was received and it was generally beneficial, although it may have prompted some spraying for mirids.

Crops are generally two weeks behind schedule, have had Pix applied and are getting ready for cut-out.

Bourke growers are stocking up on defoliants in anticipation of access problems over the next few weeks.

Southern NSW

Despite some cooler periods, the past two months has been very favourable to growing cotton (Day Degree table below). There has been very little rainfall and more importantly no significant cloud. The most advanced cotton is at 23 nodes yet there is a lot of late cotton in the mix.

<table>
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<th>District</th>
<th>Season 11–12</th>
<th>Season 10/11</th>
<th>Average DD</th>
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<th>Cold shock (ave)</th>
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<td>1187</td>
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<td>1124</td>
<td>11 (13.7)</td>
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<tr>
<td>Jerilderie</td>
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<td>1123</td>
<td>1119</td>
<td>11 (13.7)</td>
<td>35 (44.7)</td>
</tr>
</tbody>
</table>

There has been no mid season insect pressure at all which has resulted in crops with close to full retention. Prior to Christmas growers were stretching water due to the cold temperatures. But with the good heat and the high fruit loads irrigation intervals are running very tight.

On January 12, Mike Bange and Lewis Wilson presented at a very well attended field walk at Point Farms, Darlington Point. The main discussion point was mepiquat application decisions, which are proving difficult this season with some crops cutting out due to the high fruit load. This is unusual in southern NSW as crops often continue to develop and put on nodes that will not produce fruit due to lack of season length. Due to the cool finish and the earlier date of the last effective flower there is usually a point where the crops have to be cut-out.

James Hill
January 29, 2012

ANSWER TO IAN’S MYSTERY TRACTOR QUIZ

It is a super rare 1925 Lanz Feldank powered by a two cylinder engine. The single cylinder Bulldogs had arrived in 1921. Their popularity was such that the Felbank was phased out.

(Photos courtesy Herb Voigt)