**Cotton Research & Development Corporation** 

# Spring 2009 Spring 2009 Spring 2009 Cotton R&D





Spring, 2009

## Cotton Research & Development Corporation Spotting Report Corporation On Cotton R&D

Bruce Finney Executive Director, CRDC

Welcome to the spring edition of Spotlight. In this edition we traverse a mountain of topical issues commencing with carbon. The release of a report which shows that production of a cotton t-shirt has a lower carbon footprint than polyester would not be surprising in itself but that's just the beginning of some very interesting findings.



Professor Peter Grace's work on the Life Cycle Analysis of a cotton t-shirt quantifies that the production of a cotton t-shirt is less impacting than an identical polyester t-shirt. The categories examined were climate change, ozone layer depletion, mineral resources depletion and fossil fuels depletion. The research found that the production of cotton has a significantly lower footprint in every impact category assessed.

Like all good research the report highlights the need for further analysis and prompts questions such as how might we reduce the impact of washing and drying cotton textiles? Can we create an innovative textile treatment or recycle cotton clothing? Our industry marketing types will no doubt consider whether this information could better position Australian cotton in the market place.

The study shows that our farmers are embracing energy saving measures with only about eight percent of all the greenhouse gas emissions being generated on-farm during the production of a t-shirt. This, the research shows, is mainly due to the emissions inherited from the manufacture of fertilisers and pesticides, the use of diesel and electricity on-farm, and the soil emissions of nitrous oxide.

Industry meanwhile is continuing to support research and study into new energy saving technology and practices to continue help growers to make more input savings, improve productivity and reduce our carbon footprint.

But it's not just at the grower's end that energy research is focusing.

Craig Baillie and his team at the National Centre for Engineering in Agriculture have begun a study of energy use in cotton gins, what requires the most energy and what proportion is used in each process of ginning.

This information will provide the industry with benchmarks and identify ways to reduce energy consumption, which contributes to the overall reduction in energy needed to produce cotton fibre.

As a new cotton season commences, we turn our focus to Integrated Pest Management and new concerns for pests such as whitefly are on the radar.

Silverleaf whitefly (SLW) is usually more of a problem in northern cotton regions, but earlier this year populations surprisingly built up in the more central and southern regions. SLW is also problem due to its resistance to many insecticides and capacity to rapidly reproduce on cotton. The principal concern with SLW is the contamination of lint through excretion of 'honey dew'. Whitefly honey dew is worse than aphid honey dew, as it is more difficult to remove during processing.

So controlling pests like SLW reinforces the value of IPM principles including our understanding of native fauna as beneficial pest controllers and native vegetation for harbouring them.

I hope you enjoy reading the articles on our innovative southern growers and future cotton leaders – these are both stories that highlight the importance of people in generating new ideas and developing the future capacity of the industry to adapt and succeed. After all, that is there is nothing more important than making the time to recognise and build the capacity of our people.

Heading into another season with limited water supply, improving irrigation efficiency remains paramount. The industry water team members have put together some good advice for your consideration. I encourage growers to be a part of the new Water Smart Cotton and Grains irrigation benchmarking study also outlined in this edition.

On behalf of everyone at the CRDC I wish you success for the new season.

## in the spotlight ....

- 3 Cotton t--shirts have lower carbon footprint than polyester
- 6 Black Root Rot Threat
- 8 Protect the future of the industry
- **10** The 2009/I0 IRMS
- 12 Softly Softly the key to cheap, easy management of silverleaf Whitefly
- 14 Woody habitats support predator biodiversity
- **15** Innovation goes south
- **16** Cotton adds to rice on Booth's menu
- 17 Looking ahead holistically at Hillston
- 18 CRDC takes leading water research management role
- 19 Be part of the irrigation benchmarking study
- 20 Furrow irrigation keeps up with the best
- 22 Diving deep into drainage research
- 24 New-tech leaves farms safer
- Workshop on climate change and leadership
- **25** Looking back, moving forward sustaining farming families
- 26 New CEO for Rural R&D Corporations
- 26 Cotton plays key role in farming and fishing partnership
- 27 New crop of future leaders on the way
- 28 Global survey of customers' needs
- 29 Pro-active approache needed to read market signals
- **30** Fibre science explored
- 31 Evaluation of energy use in ginning
- 32 New collaborative projects in pipeline with Grains Research Corporation

Spotlight is brought to you by Australia's cotton producers and the Australian Government through the publisher Cotton Research & Development Corporation (CRDC).

CRDC is a research and development partnership between the Australian cotton industry and the Australian Government.

## Cotton Research and Development Corporation ABN: 71 054 238 316

Our vision: A globally competitive and responsible cotton industry
Our mission: Invest and provide leadership in research, innovation, knowledge creation and transfer.

**Our outcome:** Adoption of innovation that leads to increased productivity, competitiveness and environmental sustainability through investment in research and development that benefits the Australian cotton industry and the wider community.

Corporate background: CRDC was established in 1990 under the Primary Industries and Energy Research and Development Act 1989 (PIERD Act.) which outlines its accountability to the Australian Government and to the cotton industry through the Cotton Australia. CRDC is responsible to the Australian Government through the Minister for Agriculture, Fisheries and Forestry, Tony Burke MP.

CRDC is committed to fulfil its legislated charter to: Invest in and manage an extensive portfolio of research, development and extension projects to enhance the ecological, social and economic values associated with cotton production systems and to benefit cotton industry participants, regional communities and the Australian community.

Postal: PO Box 282, Narrabri NSW 2390

Offices: 2 Lloyd Street, Narrabri NSW 2390
Tel: 02 6792 4088; Fax: 02 6792 4400
Email: spotlight@crdc.com.au

Web: www.crdc.com.au Editor: Rohan Boehm Editorial coordinator: Melanie Jenson

Layout, composition & print coordination: Courier Print, Narrabri

Cover Photo: photo by Tim Boehm www.boehm.com.au

Further information:  $\$ ? Where this symbol appears, readers are invited to access further information from the identified source.

# Cotton t-shirts have lower carbon footprint than polyester

#### By Mary Ann Day

The production of a cotton t-shirt has a significantly lower carbon footprint than polyester, and cotton is much more environmentally friendly and was less prone to collecting odours and stains according to a study which looked at the Life Cycle Assessment of a 100 percent cotton Australian t-shirt.

The new study has found that a cotton t-shirt production's footprint is lower than a polyester t-shirt production's footprint in all the categories analysed.

The categories examined were climate change, ozone layer depletion, mineral resources depletion and fossil fuels depletion.

The research found that the production of cotton has a significantly lower footprint in every impact category assessed.

"Regarding climate change and fossil fuel depletion (two very related categories), cotton production's footprint is about 22 percent lower than polyester production's," the study said.

In the ozone layer depletion and mineral resources depletion categories, cotton performs even better.

However, the total footprint really depends on consumer behavior as the 'use phase' of a t-shirt is responsible for about 96 percent of a t-shirt's CO2 emissions, the study revealed.

One of the key issues raised by the cotton t-shirt study was that it indicates use of the t-shirt including washing, drying and ironing has 25 times the impact on global factors such as greenhouse gases, fossil fuel depletion etc, than do all of the processes required to grow, manufacture and retail the shirt in the first place.

The study was headed by Professor Peter Grace, Director of the Institute for Sustainable Resources at Queensland University of Technology (ISR) with senior research assistant Francisco Javier Navarro Garcia.

"A 250g cotton or polyester t-shirt's lifetime is 75 laundry cycles — including washing, tumble drying and ironing," Prof Grace said.

"We found generally cotton garments remain fresher for longer and thus need to be washed less often than polyester garments.

"The research says consumers could make big environmental savings by washing clothes more efficiently and using more energy efficient washing powders.

"One of the best ways to wash clothes more efficiently is to make sure clothes are washed only when they have lost all their fresh properties.

"This study took about 10 months and the aim was to identify the environmental footprint of a cotton t-shirt throughout its life cycle using a cradle-to-grave approach."

Senior Research Assistant Garcia said the Life Cycle Assessment methodology was chosen as it is a scientifically sound and quantitative analysis framework. "For this research project we analysed and evaluated the greenhouse gas (GHG) emissions from the production of an Australia grown, 100 percent cotton t-shirt when compared against the production of a one hundred percent polyester t-shirt using a Life Cycle Assessment (LCA).

"Using a short sleeve every-day t-shirt, we looked at a number of aspects of production as well as its use to carry out a very thorough scientific assessment.

"This was the first such life-cycle study in Australia. Most cotton LCAs have been in Europe and the purpose was to help the industry to know how well it is doing compared to competitors such as polyester. A study like this will also help to make the industry cleaner," Mr Garcia said.

The greenhouse gas emissions for each product were 25kg of CO2 emitted per kg cotton textile and 31 kg per kg polyester textile. Continued page 4



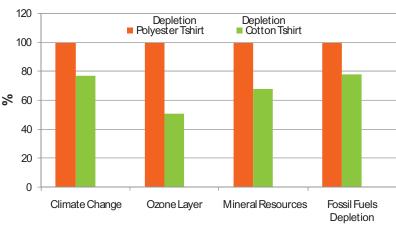


Figure I. Comparison of Cotton Production vs. Polyester production

Cotton Growth Gr



Professor Peter Grace, Director of the Institute for Sustainable Resources at Queensland University of Technology (ISR).



Queensland University of Technology (ISR) senior research assistant Francisco Javier Navarro Garcia.

## The grass is greener ... on this side

## Cotton's clean-green production out paces polyester's carbon footprint

#### From page 3

One kilogram of textile makes about four t-shirts so the emissions per unit would be about six kg of CO2 per cotton t-shirt and eight kilograms CO2 per polyester t-shirt, which is a significant difference when considering the billions of t-shirts produced worldwide.

These figures also include greenhouse gas emissions produced during the manufacture of fertilisers and pesticides.

The study however concluded that the cotton industry, although found to have less impact than the polyester industry, can still do more to significantly reduce its carbon footprint.

Prof Grace said using nitrogen fertilisers and green manure more efficiently is a good way to reduce the carbon footprint of a cotton farm.

"Additionally, using more energy efficient machinery, reduced tillage and promoting the use of alternative fuels when possible would add to lowering the cotton industry's carbon footprint even further, (Figure 2)," Prof Grace said.

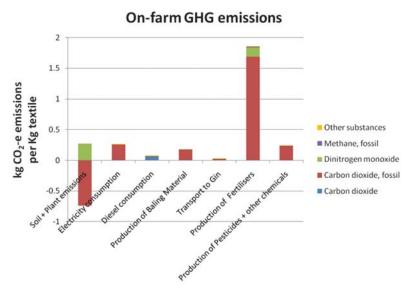


Figure 2. Carbon footprint of cotton farming in Australia..

Mr Garcia detailed some of the findings of the study.

The disadvantage of polyester was found to be its dependence on the use of Xylene (a petrochemical based on crude oil) as a raw material, which consumes very high amounts of energy. The use of crude oil is the single highest contributor to polyester's high environmental footprint.

"When we looked at the production of a cotton t-shirt, we found that the onfarm emissions are only 1.7 kg per kg textile (0.6 kg per kg cotton picked), about eight percent of all the greenhouse gas emissions during the production of a t-shirt.

"This is mainly due to the emissions inherited from the manufacture of fertilizers and pesticides, the use of diesel and electricity on-farm, and the soil emissions of Nitrous Oxide.

In comparison the washing and drying of a single t-shirt (250g) emits 86kg CO2 (Figure 3). (Note that the impact of a single t-shirt is one-fourth of the impact of a kilogram of lint.)

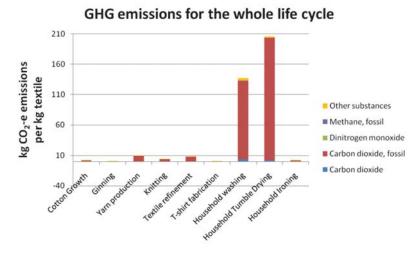


Figure 3. Carbon Footprint of Australian-grown fibre in a Cotton t-shirt.

Surprisingly, cotton production accounts for only seven percent of the total life cycle greenhouse gas emissions.

Tumble drying potentially causes the largest environmental impact, responsible for about 205 kg CO2 emissions per kg of textile, despite the fact that statistics show that 80 percent of Australian households do not possess a tumble dryer. Washing clothes causes the second highest environmental impact - totalling 137 kg CO2 emissions per kg of textile, despite many Australian households washing in cold water and washing machines not being regarded as energy intensive.

Nearly one-half of all greenhouse gases associated with clothes washing are derived from the manufacture of fluorescent whitening agents (chemicals part of the most common household detergents).

Due to the significant contribution made by t-shirt use in the total greenhouse gas emissions, as part of the exercise, the researchers examined the possibility of washing clothes less frequently at lower temperatures, using environmentally friendly detergents, hang-drying them and avoiding ironing when possible (Allwood et al. 2006).

"We found that re-wearing just one out of every twenty t-shirts reduces energy consumption significantly, but we also found that washing clothes less frequently is not equally possible using both technologies, as cotton t-shirts generally remain fresher for longer," Mr Garcia said.

"Previous studies have found that high intensity odour is related to polyester fabrics, whereas odour in cotton or wool fabrics is much less intense. Based on these results, it is argued that cotton garments have a higher re-use rate than polyester garments".

Some of the other options found for the 'ideal' consumer to do would be to buy second-hand clothing and textiles where possible, buy higher quality garments and textile products, and when buying new products, choosing those made with least energy and least toxic emissions and disposing of used clothing and textiles through recycling businesses.

Mr Garcia said "Finally, we looked at the potential of a number of energy or fossil fuel saving options to improve cotton's life cycle performance.

"The options considered were the use of different cotton lint by-products and wastes as a source of biomass to obtain energy through pyrolysis.

"Pyrolysis is a process of controlled burning of material that aims at maximising the production of useful bio-oil, synthesis gas and char, while minimising the production of useless ash - unlike incineration."

The by-products considered for energy recycling include cotton plant stalks, cotton gin waste, cottonseeds and used t-shirts.

"Textile waste pyrolysis could reduce fossil fuel depletion by about 64 percent and reduce cotton's total carbon footprint dramatically," the researchers said.

In conclusion, the report recommends several policies which could assist consumers and improve their knowledge with respect to usage.

"An eco-label could be attached to every cotton t-shirt explaining what the footprint of t-shirt use and maintenance is and suggest ideas on how to reduce it," Prof Grace says.

"In addition, information on treatments for garment 'freshening' could also be developed, but the environmental footprint of such 'freshening' would need to be lower than washing for it to be worthwhile."

Adam Kay, Chief Executive of Cotton Australia, said this study highlights the fact that cotton both in the field (growing) and in the factory (manufacturing) is a relatively low emitter.

"This also adds to the case that we should not be covered in the carbon pollution reduction scheme because we are relatively low emitters," Mr Kay said.

"This report offers valuable information that helps people to understand that a lot of times it is the consumers' actions that are having a larger impact on the carbon footprint of a product, in this case greater than the industry in its production.

"Through our research we understand where our emissions come from in cotton production and as an industry we have made moves to reduce these emissions through investment in best management practices to reduce our carbon footprint."

The study was conducted with the help of a  $50\,000$  grant, from the Australian Greenhouse Office (now Dept. of Climate Change) and CRDC.

? Contact: CRDC, crdc@crdc.com.au Phone 02 6792 4088.

# Focus on challenge of climate change for cotton



By Mary Ann Day

Responding to the challenges of lower water availability while remaining profitable are key drivers for change on cotton farms in the face of climate change, said Bruce Pyke, General Manager of R&D Investment for CRDC when addressing delegates at a workshop on climate change recently.

"Successfully responding to these drivers will give cotton growers the best chance to adapt to climate change and reduce greenhouse gas emissions as a consequence," he said.

He said a SWOT analysis being developed in relation to climate change highlighted that the industry has a sound track record of addressing environmental impacts through the adoption of BMPs and this may provide an opportunity for matching the capacity of the industry to respond to the government's goal to reduce national emissions.

The Climate Change and Cotton workshop in Sydney, funded by the Climate Change Research Strategy for Primary Industries (CCRSPI) initiative, was aimed at providing members of the cotton industry with a chance to discuss R&D issues related to climate change, particularly on-farm impacts.

"This is the first workshop we have held focusing on climate change. One purpose of this forum was to provide a broad group of industry participants with an update on what we currently know. It was also to provide an opportunity for them to have some input into how to deal with this problem over next four years and what kinds of new research, better information and improved communication we need," Mr Pyke said.

"We had a series of invited presentations, followed by a workshop session which allowed participants to consider R&D coordination, gaps, opportunities and priorities

"Outcomes from the workshop were also provided to the participants of an industry forum on climate change held in Narrabri in August."

Mr Pyke highlighted some of main issues which came out of the Sydney workshop presentations.

Owen Cameron from the CCRSPI set the scene for the day and talked broadly about the climate change agenda in relation to agriculture, cotton and research

 $\mbox{Dr}$  Greg Constable from CSIRO discussed strategies to adapt and mitigate the impact of climate change in cotton.

"He indicated some of the key concerns were that the greatest impacts of climate change will be on water use, pest incidence and fibre quality," Mr Pyke said.

"However Dr Constable also demonstrated that in cotton growing regions the climate variability already experienced is more extreme than the climate change observed to date and that which has been predicted for the foreseeable future.

"This suggests that a continuation of the development and adoption of appropriate crop rotation, minimum till and fallow management strategies to assist cotton growers to adapt to both climate variability and change is a viable strategy for the short to medium term."

Another aspect discussed was greenhouse gas emission mitigation via energy use on the farm and in the cotton gin.

"Craig Baillie from the National Centre for Engineering in Agriculture stressed that energy inputs represent a major cost to farmers and said the NCEA is developing hardware and software to enable on-farm assessments to quantify energy use and to identify where cost effective energy use efficiency improvements can be made," Mr Pyke said

Cotton producers face less impact than other agriculture sectors. Modelling studies indicate cost impacts of 60 - 0 per hectare for irrigated cotton by 2016 should agriculture be made a covered sector, according to Mick Keogh from the Australian Farm Institute. Mr Keogh provided a summary of the potential impact of the Carbon Pollution Reduction Scheme (CPRS) on the cotton industry based on a number of studies completed to date.

Professor Peter Grace from QUT discussed greenhouse gas emissions from cotton and opportunities for mitigation through improved management of soils and fertilisers.

Prof Grace also presented the initial findings from a Life Cycle Assessment (LCA) of a 100 percent Australian cotton t-shirt compared to a polyester one. (Full report Page 3, 4)

Rohan Nelson from the Department of Climate Change (DCC) discussed climate change, impacts on agriculture and how the DCC was working with industry to investigate and develop mitigation policy options for agriculture.

"Dr Nelson pointed out that there was plenty of opportunity for ongoing consultation as the government would not be making a decision on whether agriculture would be a covered sector under the CPRS until 2013," Mr Pyke says.

The presentations were followed by a short workshop session that allowed the participants to identify opportunities, gaps and priorities for research and for communication initiatives and products on climate change.

"We agreed that more discussion and further development of the issues raised during the workshop would be required," Mr Pyke said.

"CRDC will look for opportunities to achieve this in collaboration with Cotton Australia, the Cotton CRC, other RDCs and the Australian Government."

? CRDC, Bruce Pyke, 02 6792 4088, crdc@crdc.com.au

## Cotton nappies come out on top

Home washed reusable nappies have the potential for lowest impact on the environment in comparison to their disposable cousins, according to a past study, which also investigated the influence of consumers' treatment of the garments on environmental outcomes.

The study was undertaken by lecturer in Environmental Engineering, Dr Kate O'Brien and a group of students from the University of Queensland's School of Engineering in Brisbane. The life cycle assessment, similar to the t-shirt study, looked at three different types of nappies: disposable, home-washed re-usable and commercially-washed

While traditionally babies wore reusable (cloth) nappies, 95 percent of babies today in Australia wear disposable nappies that are disposed of after a single use.

Dr O'Brien says there has been vigorous debate in the community about which nappy system is more sustainable and the study concluded that reusable nappies, washed at home in cold water in a front-loading machine and line-dried require less energy and land resources, comparable water resources, and produce similar or lower quantities of solid waste, compared to the other nappy systems.

Dr O'Brien said there are also a number of ways in which users can further control and reduce the impact of home-washed nappies, below the levels quantified in the study,

The major difference between the three nappy types was found to be that the user has much more control over the environmental impact of home-washed

In contrast, the only method by which users can reduce the impact of disposable nappies was to use less of them, and the largest potential reductions lie with reducing the impacts before and after use.

Additionally, with disposable and commercially-washed reusables, all four environmental indicators assessed occur largely outside the control of the user.

General Manager of CRDC R&D Investment, Bruce Pyke, contributed data for the study.

"Both these (t-shirt and nappy LCA) studies suggest that consumer practices can have a significant influence on environmental impact, but generally environmentalists focus on growing and manufacturing and don't bring the role of the consumer into the

"It is clear that more could be done in this

TLIFE CYCLE ASSESSMENT: REUSABLE AND DISPOSABLE NAPPIES IN AUSTRALIA Kate O'Brien, Rachel Olive, Yu-Chieh Hsu, Luke Morris, Richard Bell and Nick Kendall Environmental Engineering, School of Engineering, The University of Queensland www.eng.uq.edu.au/environmental Email: k.obrien@uq.edu.au CRDC, Bruce Pyke, 02 6792 4088, crdc@crdc.com.au





Seedling diseases such as *Rhizoctonia solani* can severely impact crops regardless of varietal choice.

# The lead up to planting: a key time for disease management decisions

By Mary Ann Day

Seedling disease, Black root rot, Fusarium wilt, and Verticillium wilt are some of the prime enemies of the cotton crop, according to a recent survey by plant pathologists from Industry and Investment NSW (formerly NSW DPI), Queensland Primary Industries and Fisheries and Cotton Seed Distributors.

While the impact of diseases has been high in many areas, there is good news for farmers.

Improvements in resistance to Fusarium and Verticillium wilt mean that there is now a wider range of varieties that can play a role in integrated disease management (IDM) for these diseases.

"Variety choice is important when considering an integrated approach to managing diseases on the farm," said Chris Anderson, Plant Pathologist with Industry and Investment NSW and who runs the annual cotton disease surveys in NSW.

"Several high yielding varieties now have excellent resistance to Fusarium and Verticillium wilt although growers should realise that resistance to Verticillium wilt can break down under prolonged mild conditions.

"For example, in the 2007/8 season we saw a breakdown in varietal resistance that lead to an 18 year high in the incidence of Verticillium wilt n the Namoi.

"In the 2008/09 season, numbers returned to normal, with only 14 percent of plants being affected by this disease and this is attributed to a return to warmer seasonal conditions."

Mr Anderson said these numbers highlight the fact that varietal choice is only one part of on farm IDM.

"There is currently no resistance to black root rot in commercially available varieties and seedling disease can severely impact crops regardless of varietal choice," he said.

The survey is funded by the Cotton Research and Development Corporation and the Cotton Catchment Communities Cooperative Research Centre as part of the Diseases of Cotton project, which has supported the local cotton industry for more than 20 years.

"The main point of the surveys is to keep our finger on the pulse of plant disease in the industry. We hope that when growers see the results of this survey they will say — 'what are the problems on my farm and what can I do to make improvements?'" Mr Anderson said

"In 2008/09 the highest levels of seedling mortality in NSW were recorded in the Macquarie Valley at 39 percent and this is likely due to



Fusarium wilt is being managed by breeding resistant cotton varieties.

a combination of factors, including the seedling pathogens Rhizoctonia solani and Pythium, soil conditions, and damage from insects such as wireworm."

The lowest levels of seedling mortality in NSW were recorded in the Macintyre at 24 percent. Seedling mortality was also high in the Theodoreregion of QLD at 41 percent, where surveys were conducted by plant pathologists Stephen Allen (Cotton Seed Distributors), Linda Smith (QPIF) and Linda Scheikowski (QPIF).

"Unfortunately black root rot was found in 52 per cent of crops across NSW with the disease peaking at 66 per cent of plants in the Namoi," Mr Anderson said.

"We also found high levels of black root rot in the Lachlan and Macquarie Valleys, with 57 and 64 percent of crops respectively affected.

"This reinforces the need to continue monitoring the pathogens in those southern valleys."

Mr Anderson said that while there is currently no adequate control measure for black root rot, researchers have been testing a range of amendments and fungicides for the disease.

"There is evidence to suggest that Bion® when applied as a seed treatment can reduce the impact of black root rot. Delaying sowing to avoid cool early season conditions that favour this disease can also reduce the impact of black root rot.

"And currently one of the biggest concerns is phenoxy herbicide drift damage.

"We have been monitoring how a small amount sprayed on other crops can damage cotton.

"This spray drift damage from phenoxy herbicides, such as 2,4-D, has unfortunately become a major problem in recent years and we found herbicide damage in all cotton growing areas with widespread damage to 22 percent of plants in the

Macquarie Valley, and 19 per cent in the Namoi. Some crops near Wee Waa also suffered severe damage."

Late season surveys detected Fusarium wilt in approximately 60 percent of crops in the Gwydir and Macintyre. However recent advances in plant breeding have delivered a number of new cotton varieties with excellent resistance to the disease.

Surveys in QLD also detected only low levels of Fusarium wilt, although the disease remains widespread especially on the Darling Downs.

Mr Anderson said alternaria leaf spot and boll rots were detected in most crops at low levels.

"The range of disease threats have changed over the years since the surveys first started in 1984 under the leadership of Dr Stephen Allen," says Mr Anderson.

"Bacterial blight of cotton was a big problem in the '80s but it is no longer a problem due to improvements in seed processing and varietal resistance. Epidemics of Fusarium wilt and black root rot in the 1990s also changed the plant disease landscape, bringing new challenges to the industry

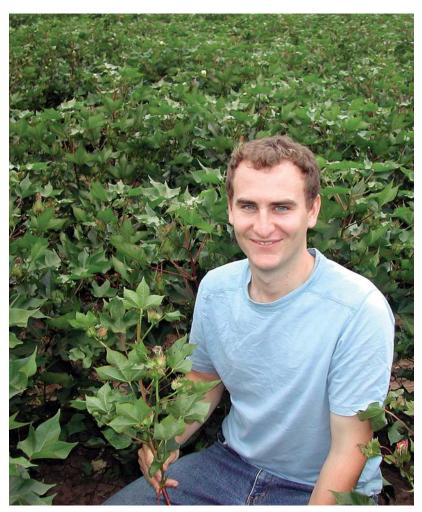
"Thankfully this decade has not yet seen the onset of any new disease epidemics and plant pathologists in QLD and NSW are working with industry to survey, prepare for and prevent incursions of exotic pathogens.

"We also survey for incursions of exotic diseases such as Texas root rot and the good news is that we haven't found any new incursions of exotic pathogens.

"We will of course continue our surveys and keep monitoring the situation to make sure that the farmers in this area know their enemies."

The surveys are conducted twice a year, overa three to six week period in October/November and a similar period in February/March each year.

? Chris Anderson, 0423 141 550.



Chris Anderson, Plant Pathologist with Industry and Investment NSW runs the annual cotton disease surveys in NSW.

## Steps for disease management

There are several steps that can be taken at sowing and early in the season to manage disease on your farm.

Firstly it is important to know which diseases are present. Seedling disease is always an issue as the pathogens that cause it are present in all cotton growing soils.

Second to seedling disease, black root rot is the most widespread disease in the industry and Verticillium and Fusarium wilt are also widespread.

There are several steps that can be taken to minimise the impact of all of these diseases. Firstly, sow into well prepared firm high beds when soil temperatures are consistently above 14°C and increasing. Delaying sowing can assist in reducing the exposure of the crop to cool early season conditions that favour seedling disease, black root rot, Fusarium and Verticillium wilt.

Choose varieties with high levels of resistance to Fusarium and Verticillium wilt if these diseases are present on your farm. Use a fungicide seed dressing and consider having your seed treated with Bion® which can improve resistance to Fusarium wilt and black root rot.

Try to sow on moisture or pre-irrigate where possible, rather than watering up.

For more information on the cotton disease surveys, growers can contact Chris Anderson, 0423 141 550.

8 **Spotlight** Spring 2009 Spring 2009 Spotlight 9



## Protect the future of the industry

The National Cotton Industry Biosecurity Plan is currently undergoing its first revision since its release in late 2006. The revision process has involved updates of the risk reviews for each of the priority pests and diseases as well as an expansion of the risk mitigation strategies and greater focus on surveillance activities.

Active surveillance and reporting offers the industry its best chance of successfully eradicating an exotic incursion

Cotton growers are the key to industry surveillance for exotic insects and diseases. While industry researchers undertake surveys across the cotton industry at points in time, growers together with their farm staff and consultants can be on the lookout for unusual crop symptoms throughout the season

Surveillance requires only a basic knowledge of

the key symptoms to look out for and an interest in identifying the cause of those symptoms. The cotton industry offers diagnostic services to help with identification. This edition of *Spotlight* covers the key symptoms of the six exotic diseases that pose greatest threat to Australian cotton production.

If any of the six priority diseases were to become established in Australia, the production losses could be devastating. In many cases, the best way of rebuilding productivity would be through breeding new varieties with new mechanisms of resistance or tolerance, a process that can take many years.

In the absence of germplasm protection new management strategies would need to be developed that may be expensive and prove challenging for cotton IPM systems.

When an exotic disease is detected early enough, eradication programs can be successful. Through

the Industry Biosecurity Plan, the cotton industry has in place procedures that provide the industry with the ability to fund an eradication program.

Depending on which disease it is, the Australian government may also assist in the funding of an eradication program. As a result, there could be significant benefits to the affected growers as well as the industry as a whole if an exotic disease is detected and reported early (i.e. a positive cost benefit from an eradication response).



## Want to know more about the National Cotton Industry Biosecurity Plan?

Version 2 of the Plan is due for release in November. Keep a look out for it on the Cotton Australia website. Go to www.cottonaustralia.com.au

As a follow up to this feature, the Summer Edition of Spotlight will include the basic the information required for active surveillance for the key exotic insect and mite pest threats to Australian cotton.



## VERTICILIUM WILT – Defoliating strains

Australian strains of Verticilium wilt are described as mild in comparison to the defoliating strains that originated in North America but are now becoming more widespread. If established in Australia, management would be reliant on the use of resistant varieties, with a lag of several years before adapted varieties were available.

#### Symptoms

It may be difficult to differentiate between the exotic and commonly occurring strains visually. Both can cause yellowing of the leaves at the edges and between veins followed by death of leaf margins. Exotic strains lead to a rapid downcurling of the terminal leaf, general chlorosis and vascular discolouration in stems, followed by sudden and almost total defoliation and abscission of bolls. Symptoms may also be confused with Fusarium wilt.



## COTTON LEAF CURL DISEASE (CLCuD)

CLCuD, sometimes referred to as Gemini virus, can cause yield losses of up to 35% in cotton. It is spread by a whitefly vector. There are at least seven different begomoviruses and several different DNA satellite molecules associated with CLCuD. A cotton plant needs to be infected with at least one begomovirus and one satellite to develop the disease. CLCuD would be best managed by breeding for resistant varieties however there is no known durable plant resistance to any of the pathogens.

#### Symptoms

Initially CLCuD appears as swelling and darkening of leaf veins, followed by a deep downward cupping of the youngest leaves then either an upward or downward curling of the leaf margins.

Leaf-like structures (enations) on the veins are common and vary in size from only a few millimetres in diameter to almost the size of a normal leaf

## FUSARIUM WILT – Exotic strains

Strains of Fusarium were identified in Australia in 1993 however they are different to those in present in North America, China and Africa. Several races found in other regions of the world are more damaging than those already established in Australia, particularly when in combination with nematode pests. New resistant varieties would be required for management.

#### Symptoms

Symptoms are similar to the Australian strains but become much more severe. Leaves appear dull and wilted before yellowing or browning progresses to eventual death from the top of the plant. The fungus grows into the vascular system moving up the stem with the flow of sap. The plant tries to prevent progress of the fungus by blocking the vascular tissue, resulting in the brown discolouration in the stem. Symptoms may be confused with those of Verticilium wilt.



## TEXAS ROOT ROT

Texas root rot is an extremely damaging fungal disease with a wide host range. It causes sudden death of affected plants, usually during the warmer months. In cotton, infection can result in 100% crop loss. If this disease became established in Australia, control would be extremely difficult as management using rotations and fungicides is usually only partially effective.

#### Symptom

Roots die and their surfaces become covered with a network of tan fungal strands. Leaves initially turn yellow or bronze then wilt and die. Dead leaves usually remain on plant.



## BLUE DISEASE

Blue disease is a virus specific to cotton that can reduce yield potential by up to 20%. Blue disease is spread by a vector, the cotton aphid. It has been reported in Africa, Asia and the Americas. Control of the disease relies on selecting varieties with tolerance and using these in combination with aphid control and rouging crops to remove infected plants.

#### Symptom

Leaves tend to be smaller, thicker, more brittle and leathery than healthy leaves. Leaves may have intense green to bluish colour with yellow veins. Leaf edges tend to roll downwards. Plants become stunted due to a shortening of the branch internodes. Reddening of stem petioles and leaf veins can occur in some infections.



### BACTERIAL BLIGHT - Exotic strains

Although strains of bacterial blight are already present in Australia, they are no longer a problem due to varietal resistance. Exotic strains (races) occur in many other cotton growing countries that are 'hypervirulent'. If these established in Australia, they would cause significant yield losses.

#### Symptom

Undersides of leaves have angular water soaked lesions which dry and darken with age then leaves are shed. Black lesions spread along stem. Bolls often become infected at base or tip. Boll lesions dry out and prevent the boll opening.



## Cotton Industry Diagnostic Services at the ready

Spotted something unusual such as;

- Tissues inside the stem going brown
- · Leaves wilting or falling off
- Dead plants

Immediately contact: Linda Smith

Queensland Primary Industries and Fisheries

Plant Pathology Building, 80 Meiers Road, Indooroopilly Q 4068
Telephone 07 3896 9538

Spotted something unusual such as;

- Severe stunting of the plant
- Leaves that are irregular in their shape or texture
- Leaves with veins that appear darker or lighter than usual Immediately contact: Cherie Gambley and Murray Sharman

Queensland Primary Industries and Fisheries
Plant Pathology Building, 80 Meiers Road, Indooroopilly Q 4068
Telephone 07 3896 9299

10 **Spotlight** Spring 2009

Spring 2009 **Spotlight** 11

Throughout May, June and July, Cotton Australia's TIMS Committee sought input from the cotton industry on changes to the Insecticide Resistance Management Strategy for the coming cotton season. There was significant participation from regional Cotton Grower's Associations (CGAs), cotton consultants, via the Crop Consultants Australia group and CropLife members in this process. Feedback was considered by the TIMS Committee and the finalised IRMS has been announced.

## The 2009/10 IRMS

## Changes affecting the structure of the

The Darling Downs CGA supported the merging of the Downs and Central strategies, while a separate strategy was formed for the Southern Region. In 2009/10 the regional strategies are:

- · Northern Regions (Central Highlands, Dawson and Callide valleys);
- · Central Regions (Darling Downs, Balonne, Macintrye, Gwydir, Upper & Lower Namoi and Bourke);
- Southern Regions (Macquarie, Lachlan and Murrumbidgee).

To achieve greater focus on insecticide products that in current use by the cotton industry, products that are registered but not commercially available now appear at the bottom of the IRMS charts and are 'greyed-out'.

#### Changes affecting insecticide use within the IRMS

#### **Window for Altacor**

The new DuPont heliocide Altacor appeared in the IRMS for the first time last season with a maximum of three applications. The timing of these applications was not windowed, allowing the industry the opportunity to identify how the product could be best used. Based on feedback from consultants, growers and DuPont, the windows imposed this season enables the product to be used to its greatest advantage while lowering the risk of resistance.

A general principle at the heart of IPM strategies for cotton is to minimise the use of broad spectrum insecticides such as synthetic pyrethroids (SPs). Consistent with this principle, the window for using SPs will open on January 15 this season rather than December 15.

## New statement regarding use of neonicotinoids for managing secondary

Neonicotinoids have emerged as an important group of insecticide chemistries for the cotton industry.

All seed treatments offered by CSD contain an active ingredient from this group. Several of the key foliar spray options - Shield, Confidor and Actara - are also from this

In 2007/08 resistance to this chemistry group was detected for the first time in cotton aphid. In 2008/09 resistance factors high enough to cause field control problems with this chemistry group were detected. Also in 2008/09resistance to diafenthiuron (Pegasus) was detected for the first time. Aphids now exhibit resistance to most modes of action that can be used for their control.

This is of serious concern to the industry. The direction for alternating at planting and foliar insecticides now reads; "Failures with neonicotinoids against aphids have been confirmed. Do not follow a seed or planting insecticide with first foliar spray from the same group. ALTERNATE."

## Trouble Shooting Committee

The TIMS Troubleshooting Committee (TTC) is in place to provide a clear process for handling requests for within-season changes to

Any grower or consultant can initiate a request to temporarily alter the Strategy for a district. However the TTC will only assess requests presented with clear evidence of why the requested change is necessary and that it has been discussed and has majority support at a local level, such as with local consultants or through the local Cotton Growers' Association.

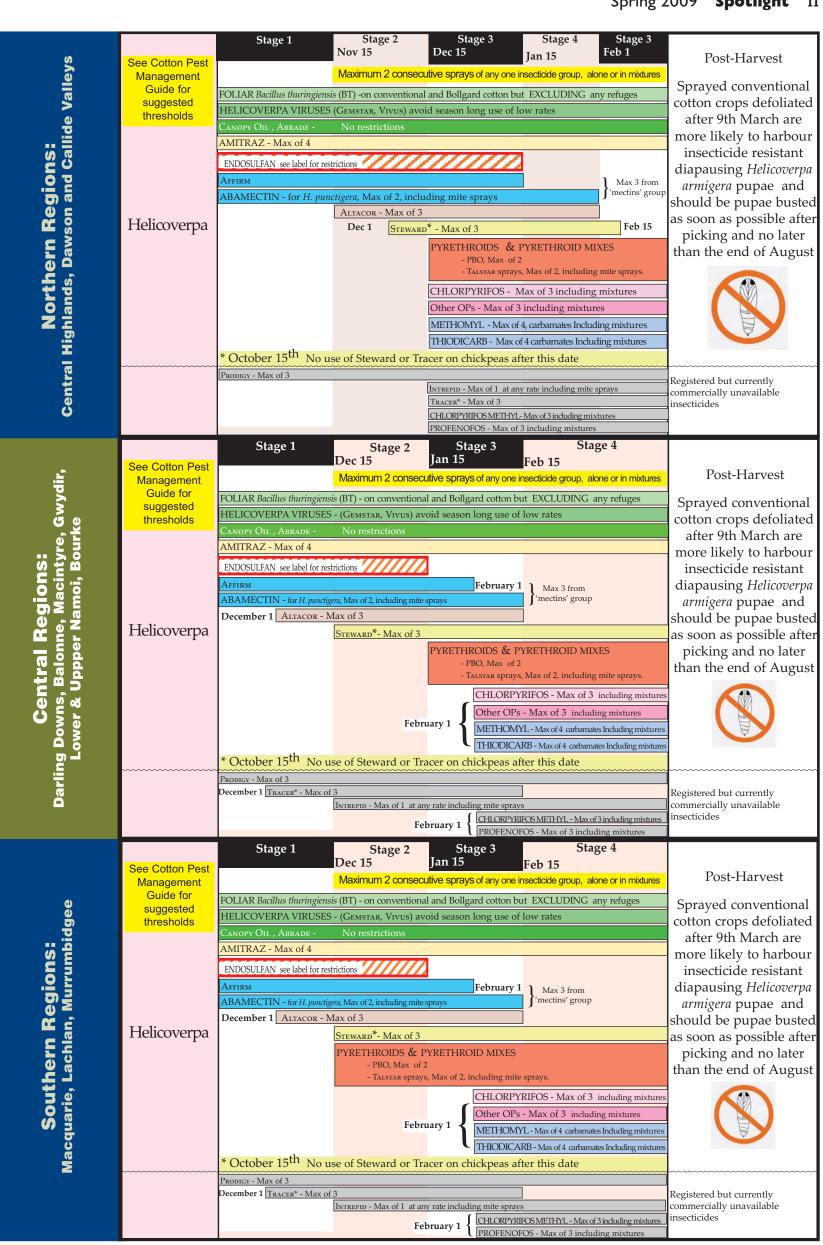
The TSC is made up of representatives from CSIRO, I&INSW, CRDC and CA. Requests should be made by phone and email to Greg Kauter; gregk@cotton.org.au 0429 700 711 and Tracey Farrell; tracey.farrell@crdc.com.au 0427 921 555.

A return contact name and phone number should be included so that receipt of the request can be acknowledged and further discussion can be held with a TTC member if required.

Northern Regions; November 15 - February I.

Window for synthetic pyrethroids opening later in the season in Central Regions

#### Stage 1 Stage 2 Stage 3 Dec 15 Feb 15 With-Post-Crop See Cotton Pest Maximum 2 sprays per mode of action group, including mixtures, unless otherwise indicated below. Managemen Management Rotate chemistry. No consecutive use of the same group Guide for Failures with neonicotinoids against aphids have been confirmed. Do not follow a Period suggested eed or planting insecticide with the first foliar spray from the same group. **ALTERNATE** STOP 009–2010 Insecticide Res Management Strategy for 1 days **Aphids** 8.10&5d Over winter 21 days ing resistant Finish date determined by crop growth (see label) 28 days populations by practis-ENDOSULFAN - see label for restrictions ing good 14 & 21 da farm hygiene (see IPM ALDICARB In furrow at sowing Guidelines) 0 days **Aphids** and Mites Start date determined by canopy closure (see label) PEGASUS DICOFOL - NSW only + Ground application only PARAMITE - Max of 1 0 days Mites 8 days 4 days Refer Silverleaf whitefly Threshold Matrix and associated Notes Mirids



12 **Spotlight** Spring 2009 Spring 2009 **Spotlight** 13



...a soft approach to the management of all insect pests is the holy grail of reliable whitefly management.

At the Cotton Collective in Narrabri in August, industry heard that while whitefly is ready to pose a threat to production, experience shows that with careful management, whitefly need not be a particularly difficult or expensive threat to manage.

## Softly Softly – the key to cheap, easy management of Silverleaf Whitefly

In a forum dedicated to the management of whitefly in cotton, perspectives were presented by leading industry researchers Lewis Wilson, Richard Sequeira, Robert Mensah and Zara Ludgate, with validations based on field experiences from Emerald based consultant, David Palato. All agreed that a soft approach to the management of all insect pests is the most effective method for reliable

## Researchers' top-10 tips for managing whitefly in 2009-2010

## 1. It's a numbers game.

To succeed, you need to be aiming to manage the size of the population, not be setting yourself the goal of eliminating them. Unlike management of other pests, whitefly management isn't about economic thresholds. Direct loss of yield from whitefly feeding is unlikely. The aim is to manage the population to protect the quality of the lint at the end of the season.

## Start low

It cannot be over emphasised how important it is to start the summer with the lowest possible population on farm. Populations ticking over in weeds around field edges and in dirty fallows will move into crops earlier and in higher numbers. Higher numbers give the whitefly the edge over their natural enemies and reduce the number of generations it takes to reach outbreak levels.

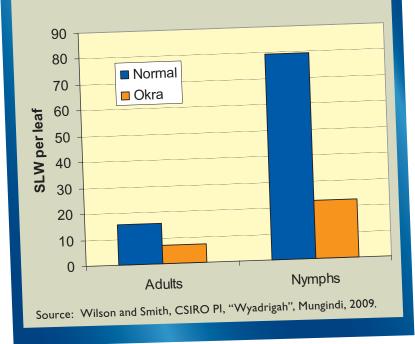
## Tackle it as a local team.

Work with your neighbours as a team to keep planting windows of host crops as tight as possible. Late planted crops will be at high risk of invasion by populations that are challenging to manage. As earlier planted crops finish off or are defoliated, whitefly will leave, seeking new food. These whitefly will migrate on the wind in massive numbers. If this occurs over a number of weeks, there are no effective management strategies to protect these late



## Avoid having a problem.

While there are many factors to be considered in varietal choice, another is the relative attractiveness of the variety to whitefly. A survey of SLW numbers on cotton late in the 2008/09 season showed that okra leaf varieties had about half as many whitefly as normal leaf varieties (see Figure 1). An additional benefit is that mite populations also increase more slowly on okra leaf varieties.



## Beneficials are your best

A range of beneficials, including parasites and predators can severely retard development of a SLW population, and they do it for free. Beneficials offer the most value when SLW populations are at low, sub-economic levels by slowing down the rate of exponential growth of the population. To do this, their conservation needs to begin from seedling mergence, not begin once there is a problem.

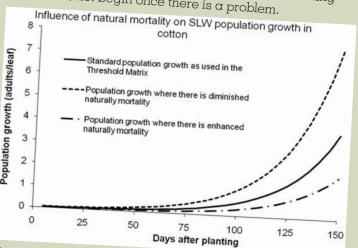


Figure 2. Source: Richard Sequeria, QPI&F.

While climatic events such as rain are recognised to cause natural mortality of SLW, beneficials are by far the most influential natural mortality factor.

A simple examination of the way exponential growth rates affect population build up shows the value in conserving beneficials from the start of the season. The Threshold Matrix for SLW in cotton assumes that the crop is being managed in a way that natural mortality factors are able to have a moderate impact on the rate of population

If, as in Figure 2 above, the low population at the start of the season, isn't suppressed from early in the season by natural mortality factors, including beneficials, the population can reach outbreak levels much earlier, leading to difficult management decisions. Alternatively, when crop management and seasonal effects combine to enhance the natural mortality factor, no intervention may be required.

## 6. Don't spray sub-threshold.

Every insect control decision made during the cotton season should consider the impact on beneficials. Dr Mary Whitehouse showed that in 2006/07 across the industry, 54 percent of mirid sprays were applied to sub-threshold populations for no gain in yield, in either water stressed or fully irrigated situations, compared with waiting and only treating at or above threshold. A 'precautionary' spray that takes out important beneficials and induces a whitefly outbreak becomes a very expensive spray decision.

## 7. Know your whitefly population well.

In order to make good decisions about how to manage your situation, it is helpful to understand the species composition of the population. What biotypes are present -SLW, Q or Australian native. The Toowoomba Entomology Unit, QPI&F offers a diagnostic service for distinguishing the different biotypes that make up the Bemisia tabaci species complex. Species composition may change as the season progresses, requiring more than one check.

## Use the recommended sampling strategy.

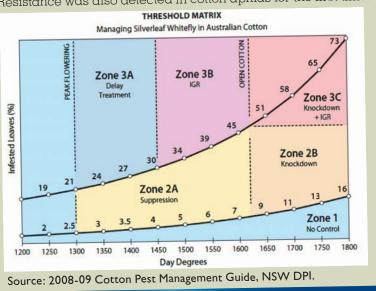
Once the presence of SLW is confirmed apply the recommended sampling strategy. Counting just the adults is a way of estimating total whitefly numbers (adults plus nymphs). It assumes that if there are many adults then there will also be many nymphs. This is recommended practice when a predominance of SLW has been confirmed. However when mixed populations are present (GHW + SLW), using just the adult counts will potentially see you reach the action threshold and apply an expensive spray unnecessarily.

## Follow the Threshold Matrix.

The Threshold Matrix has been developed using Australian field research and has been validated in commercial situations. It is designed to help get the best out of the limited chemical options that are available. The window for the use of each product based on day degree zones. The zones identify the time when the product will be most effective and the risk of pest resurgence after the application is minimised.

## 10. Follow the IRMS recommendations.

SLW are able to develop resistance to insecticides rapidly. Ensure a maximum of one application of Admiral® occurs each season. This is particularly important while the distribution of Q biotype in cotton regions remains largely unknown. The Q biotype is highly resistant to Admiral®. A maximum of two Pegasus® sprays can be used per season for mites, aphids and/or SLW. Last season resistance to Pegasus® occurred at low levels in SLW populations from across the industry. Resistance was also detected in cotton aphids for the first time.



In the future it is possible that other tools will be available to help manage SLW, such as the bio-pesticide and semiochemical products being developed by Dr Robert Mensah, Industry and Investment NSW (formerly NSW DPI) and insecticides from the various agrichemical companies. In the meantime it is critical to practise effective IPM to manage SLW and preserve the efficacy of existing products.

This article was prepared with the input of Susan Maas, Zara Ludgate, Lewis Wilson, Paul DeBarro, Richard Sequiera, David Murray, and Paul Grundy with the assistance of research communities from Cotton Catchment Communities CRC, DEEDI QPIF, and CSIRO.

**?** For further information, contact your Cotton Industry Extension Specialist, or Susan Maas 07 4983 7401, susan.maas@dpi.qld.gov.au Admiral® is a Registered Trademark of SUMITOMO CHEMICAL Co., JAPAN. Pegasus® is a Registered Trademark of a Syngenta Group Company



## CROP PROTECTION



Insect predators including red and blue beetles, ladybirds, damsel bugs and lacewings were collected in native windbreaks containing Eucalyptus spp, river red gum, acacia, melaleuca and casuarinas.

The predators were also found in dryland lucerne, grassy paddocks and stock routes surrounding cotton fields.

## Woody habitats support predator biodiversity

A recently completed CRDC research project by UNE PhD student Ingrid Rencken has confirmed non-crop vegetation plays an important role in supporting beneficial insects.

Conducted through the Cotton CRC, this research supports the idea that native vegetation plays a significant role in the natural suppression of pest populations. Native vegetation supports arthropod predator populations that colonise cotton crops however there is a likely trade off between benefits of insect pest management derived from non-crop vegetation and the costs in establishing, maintaining and managing the surrounding non-crop vegetation, Ms Rencken's study found.

In general, Ms Rencken said, woody habitats support a higher biodiversity than crops.

"This non-crop vegetation supports arthropod predators during the winter months by providing breeding sites and alternative sources of food," she said.

In another related study funded by the Cotton CRC, Felix Bianchi (CSIRO) has shown that native vegetation (comprising a mix of poplar box, acacia and salt bushes) is a source of whitefly parasitoids.

Using marker cotton plants infested with whitefly nymphs Felix and his team were able to demonstrate that fields closer to native vegetation had higher rates of parasitism than those fields further away from the native vegetation.

Interestingly, native vegetation did not appear to be a source of cotton insect pests.

Ants appeared to be important predators of Helicoverpa eggs and were numerous in cotton fields and within the native vegetation.

In an elegant marking experiment using rubidium - a rare-earth trace element - Charles Stuart University PhD student David Perovic demonstrated the movement of arthropod predators from shelter belts into cotton fields.

Rubidium marking has the advantage that it is both a contact marker as well as being absorbed by the plant so any insect feeding on the plant is also marked.

In his experiment, a 0.4ha area of native vegetation was sprayed with rubidium. Marked predators (Oxyopes spp, red and blue beetles, ladybirds) were collected at a one, three and five day interval in the adjacent cotton field

He went on to investigate the movement of predators at a landscape level using cost-distance modelling.

This method identifies the most efficient path from one location in the landscape (eg non-crop vegetation) to another (eg cotton crop).

Using this model it was shown that the natural enemy density within the crop was positively related to the area of non-crop land surrounding cotton fields, suggesting that the greater the area of non-crop area the higher the expected density of natural enemies within the field.

The arrangement of the non-crop vegetation within the landscape may also be important as the model suggested that red and blue beetles preferred to move through wooded areas first, then grasses and then crops.

This would mean that red and blue beetles can much more effectively move and colonise cotton crops in landscapes containing forest patches and wind breaks than in landscapes composed of only crops.



## Innovation goes south

Irrigators in southern areas of NSW are growing cotton in challenging environments and in innovative ways.

According to I&INSW Southern Regional Cotton Extension Officer James Hill, the lack of water allocation continues to be the barrier for expansion of the industry.

In the short season area of southern NSW - which covers Hillston in the North West, south to Hay and east to Leeton including Griffith -12 farmers grew cotton last season. While last season was a particularly hard one, 3000ha of cotton was grown, a little down on  $07/08-3300\mathrm{ha}$ , however 5100ha was grown in 2006-07.

"These growers are progressive people who are keen to take on new challenges and learn new skills to extend the diversity of their farms," Mr Hill said.

Mr Hill says planting timeliness is the key factor with growers planting as soon as temperatures allow.

"Crops have to be planted before October 15," he said.

"This date varies as each season is different. Some years late September is warmer than early October and we have had frosts during November.

"Therefore timing of planting centres around when there is a warm air flow and not a southerly system." Earliness is a priority and this has been extended using hands-on practical field walks, mainly aimed at the newer growers in the region and covering issues such as planter set up, IPM, cut out Pix, defoliation and picker set-up.

While working with cooler weather than most cotton growing regions at season's start, extreme heat is another issue faced during the season often during peak flowering.

"Last season there was a period of just over two weeks where the daily temperature exceeded 40 degrees C," Mr Hill said.

"Development of new varieties is helping the cause down south, with some very good short season varieties for growers to take advantage of.

"Growing Bollgard assists with earliness as we have less tipping or branching occurring.

"It also assists with fruit retention which is vital as we do not have the opportunity to make up for lost fruit later in the season.

"Growers use large rates of Pix early to shut the crop down and to ensure even maturity."

To protect seedlings, some growers pre-irrigate, plant into moisture and then pull up a cap to help insulate the ground during germination. This cap is removed again just prior to emergence.

Others are using bankless channels which allows water to be on and off the field quicker, so that the

Industry & Investment NSW Southern Regional Cotton Extension Officer James Hill: "These (southern) growers are progressive people who are keen to take on new challenges and learn new skills to extend the diversity of their farms".

seed does not suffer from water logging as when using syphons to water up.

Access to information, knowledge and experience in cotton growing is praised by newcomers to the industry.

"One of the reasons for the cotton industry's success is its openness to ideas and the exchange of information that occurs between growers and regions," Mr Hill said.

"The new growers have been assisted by the established growers who are always available for information

"But it is a two-way street. The new farmers have also brought with them ideas from other crops such as the bankless channel system."

Mr Hill said that extension for new greowers has been important in terms of knowledge flow in pre-irrigating in the bankless channel system and promoting early cut out.

"It has also been important in terms of promoting work such as Robert Mensah's use of spray oils to control Mirids. This has been taken up by about a third of growers). Ian Rochester's nitrogen use efficiency work has also been well accepted."

? Contact: James Hill Southern Regional Cotton Extension Officer NSW Department of Primary Industries Cotton Catchment Communities CRC 02 6993 1608, 0447 773 791 james.hill@dpi.nsw. gov.au 16 **Spotlight** Spring 2009 Spring 2009 **Spotlight** 17



## Cotton adds to rice on Booth's menu

By Melanie Jenson

"Birrali" is an 830ha mixed farming operation with 650ha irrigation, situated between Griffith and Hay, an area traditionally known more for citrus trees and rice than for cotton crops.

New grower Peter Booth is coming into his fourth year of growing cotton. He says losing 30 percent of his groundwater allocation forced the change of thinking into how he was going to more efficiently

Also faced with continuing drought and drastic reductions in allocations, Peter has grown many crops including cotton, seed pumpkins and seed onions for the past three years.

"There were record rice prices this year and last year - but availability of water is the issue – I'm not really looking at rice at all – only what I can grow most efficiently with the limited water I've got," Peter says.

In my experience rice needs twice as much water as cotton.

The farm traditionally grew rice and wheat, but the recent experience of growing new crops has been an interesting and enjoyable one, Peter

He was pleased with yields in his first two seasons of 10 and 12.3 bales/ha respectively. However last year due to a cold start and very hot finish during

early February – where Peter says they had 20 days around 40 degree mark resulted in a 6.3 bale crop.

Last season he grew Sicot 43BRF and also ran a trial in conjuction with CSD with two new varieties, Sicot 71BRF and

"The same time as the Victorian bushfires we had a day here of roaring winds and 45 degrees – and a run of that weather lasted more than two weeks - all the crops around the district were affected. The highest yield around here that year was around the nine bale mark," he

The switch to cotton has been relatively simple – it is grown in the same fields

Cotton is farmed in bays — with furrows inside the bays and large bankless channels at either end. Bays are from 400-600m long and about 150m wide. There is a 10cm step between each bay and is irrigated virtually the same as rice, except the bay is not completely flooded. With cotton the water runs up the furrows inside the bays.

Peter found earthworks to convert fields to cotton were minimal

"We knew we had to have flat bays and previous landforming had been downhill," Peter said.

"But once landform has been done for

Peter said the transition to cotton growing had been made smoother with advice and information from cotton growers around Hillston and I&INSW

"The other growers have been very obliging and very informative - the support is amazing and I picked the brains of everyone.

"It's been an interesting and enjoyable

"One thing I have learned is that compaction in your country is certainly

"Also with cotton you have to get ground ready very early because we need to run

## Southern varieties tested.

Peter Booth's trial included Sicot 43BRF, and two new varieties Sicot 71BRF and Siokra V-18BRF.

According to CSD's Extension and Development Agronomist for Central and Southern NSW Regions Craig Farlow, there was very little between the first two varieties with the 43BRF yielding 7.1b/ha and the 71BRF yielding 7.0b/ha. The V-18BRF was a little behind at 6.3 b/ha.

"Climatically it was a difficult season with a very hot spell from late January," Craig says.

"This was compounded by the freshly lasered condition of the field and so the result was well below Peter's expectations of 12 b/ha achieved the previous year.

"However this is just part and parcel of the learning to grow any new crop; the ability to adapt to whatever the season throws at you and refine your farming system to better manage it.

"The shorter growing season in southern regions does make it more difficult for the crop to compensate for stress periods but this was reflected in the performance of other crops such as rice as well.

"Cotton is definitely a profitable cropping option for southern growers and it allows growers to spread their risks and water a little further.

## Looking ahead holistically at Hillston

The Storrier family is improving their soil health by increasing soil biological activity, with manure and compost at "Riverview", "Whealbah" and "Ace of Hearts" west of Hillston on the Lachlan River.



Above: Rick Storrier explains the process of composting at a soil

health field walk. "Our soil tests showed that fungal

Compost has not as yet been used as a direct replacement for synthetic fertilisers, however they have done a comparative trial with the compost and MAP.

levels were depleted from tillage,

spraying and fertilising."

"The results we saw in this trial are what gave us the confidence to go along the composting route," Rick

"Our observations were that the field with the compost had a slightly higher yield than the other which had MAP applied."

Just a few months ago the special compost blend was spread on wheat and cotton country at the rate of one

They are currently using a compost blend of crop stubble and chicken

12 week process. By spreading the manure on a compacted bare earth pad and turning it with a purpose made machine they are currently

"Getting microbes back into the ground ... is the philosophy."

Right: Mick Storrier and the Storrier family have a reputation for sound farm management, providing good environmental outcomes coupled with high Images courtesy James Hill

"We monitor crops to see what they need, with leaf tests during the season and in the last 12 months we have gone to sap testing," Rick said.

"Sap testing gives us a more accurate picture of what is travelling through the plant at the time, as we can send a test away on Monday and have it back on Thursday. We find it more up to date as the test results are back

"Uniformity of our testing is also assured as we take the samples

"Samples are always taken from same place in the field using GPS plots and at the same time of day.

"In wheat crops they are taken three times a season, at early tillering, second node stage and just prior to

I&INSW Southern Regional Cotton

Extension Officer James Hill said the family has always had an innovative approach to growing cotton.

'The Storriers would be one of the leaders in terms of consistently growing high yielding and early maturing cotton," Mr Hill said.

"They have always farmed in way that limits their impact on the

Much of the knowledge used on farm has been gathered from courses, field days, background reading and pure

 $\hbox{``Education is so important--continue'}\\$ your education, get out there and network and look for alternative ways to do things," is Rick's advice to others who are looking for alternative, sustainable ways to improve their farming operations.

cotton we can still grow rice in that

The need for new cotton growing machinery and implements was not prohibitive either, Peter explained.

"We do all the spraying ourselves and purchased a precision planter and I am in shares with some other growers here

The cotton is ginned in Hillston 130km

Cotton Extension Officer James Hill.

very tight crops rotations here.

"Marketing your own cotton and cotton seed has been a challenge – because with rice we used to deliver it a co-operative (now to Sunrice) - who markets it on behalf of the grower."

according to Richard.

West of Hillston the operation involving Paul and Carole Storrier, and their family of Michael and his wife Stacev, Rick, sister Jenny and her husband Paul Cleton, has grown between 200 and 500ha of summer crop. The mix has been 80 percent cotton and 400ha of winter crop.

By Melanie Jenson

For six years chicken manure has been applied as a fertiliser to the fields alongside traditional synthetic fertilisers, but now the move is away from raw manure to compost which they make on-farm.

Improved soil health and consistently good yields coupled with around a 20 percent reduction in synthetic N use,

"The direction our business wants to go is to improve the soil as to get the quality and the yields in our crops," Michael Storrier said.

"We don't want to be taking from the soil to achieve these higher and quality yields – we want to improve it at the same time.

"We will then reduce inputs and decrease our reliance on conventional fertilisers."

Getting microbes working to make nutrients available to the plant is the philosophy of the Storriers.

That is why they are now experimenting with different forms of compost, which they also make on

Rick Storrier said getting right balance in the soil biology is the

"Micronutrients and the right balance" are the one of the keys This makes compost making a 10-

To improve their compost and make it more specific to their soils' needs, there are plans to experiment with other products in the blend such as cow manure, pasture hay and corn silage which would also be sourced

Taking "a holistic view of the crop's needs as opposed to just N P and K levels" is how the Storriers' approach farming, they say.

18 **Spotlight** Spring 2009 Spring 2009 **Spotlight** 19







Collaborative effort: CRDC Communications Manager Rohan Boehm with NPSI Program Co-ordinator Guy Roth and NPSI communications manager Tony Clancy at the CRDC

## CRDC takes leading water research management role

The National Program for Sustainable Irrigation (NPSI) is a partnership between 14 investors from commodities, research and development corporations, water providers and the Australian Government. The Program provides national leadership to identify, purchase and manage research useful to irrigators with the aim of substantially improving the productivity and sustainability of irrigation.

The Program was initiated by Land and Water Australia and the Cotton Research and Development Corporation (CRDC) has been a partner since its commencement. In recent years the CRDC has been fortunate to have cotton grower, Andrew Parkes, represent the CRDC and reinforce the focus for practical and adoptable research as a member of the program management committee.

A decision was made by the Australian Government during its 2008 budget to close down Land and Water Australia. In recognition of the importance of irrigation R&D to the future of the industry and agriculture as a whole and following consultation with Cotton Australia and DAFF, CRDC successfully sought support from the partners to take over the management of the national program in July 2009.

The Program funds and manages irrigation research projects across Australia, working at the property level with farmers, at catchment level with policy makers and planners, and across commodities and state borders. Research and extension aims to benefit all irrigators, from intensive scale citrus growers and dairy farmers to broad acre crops of cotton and

With a vision for Australian irrigation that is valued for its environmental, economic and social contribution, the Program aims to achieve this by investing in research, development and its adoption to improve the productivity and sustainability of irrigation. Guy Roth, who is well known within the cotton and irrigation industry, is the National Coordinator for the Program. Guy says the involvement of CRDC brings many benefits.

"This collaborative investment enables the cotton

industry to benefit from a portfolio of irrigation research that is broader in scale and scope than it could achieve on its own. The Program is also contributing to the development of national irrigation research capacity and related policy development," he said.

"The investments aim to improve irrigation water use efficiency and productivity, reduce environmental impacts, and encourage more prosperous communities.

"Through the program we aim to see improved skills, knowledge and decision making of end users which leads to practice change, and more efficient and sustainable use and management of water.

"NPSI provides a national approach to irrigation related R&D in Australia, which includes a strong focus on a skilled human resource base and enhanced R&D capacity and collaboration."

#### Some examples of projects with direct relevance to the cotton industry include:

Water Smart Cotton and Grains in NSW, overseen by I&INSW Water Use Efficiency Officer Janelle Montgomery, Moree; delivering irrigation training, farm walks and technology demonstrations to increase knowledge transfer and encourage the adoption of irrigation best practices to improve WUE. Water use indices and benchmarks will be measured on both the cotton and grains crops. This project is funded by the National Program for Sustainalbe Irrigation (NPSI) CRDC GRDC and DEWHA

Another project is investigating optimising delivery and benefits of aerated irrigation water, which is developing a training manual and decision support tool for implementing oxygation into crops in QLD, NSW and SA to increase crop yield and quality by overcoming root oxygen starvation caused by

Further research projects related largely to the cotton industry include soil management for irrigated agriculture, channel evaporation mitigation, quantifying surface water - groundwater exchange using thermal and chemical measurements, optimizing the use and returns from irrigation dams.

Reviewing precision irrigation technologies and their application is being undertaken by Professor Rod Smith, University of Southern Queensland who is developing a framework to guide research, development and adoption of precision irrigation as part of a precision agricultural system.

Management of irrigation water storages: carryover rights and capacity sharing; increasing the resilience of Eastern Australian irrigated farm businesses and root zone salinity, nutrient and water movement under irrigated cotton and grains are just some of the projects currently managed by NPSI.

? New Ideas for Irrigation - http://www.npsi.gov.au Guy Roth 0417 223 179

#### **NPSI Partners**

Australian Government Department of Environment, Water, Heritage & the Arts

Cotton Research and Development Corporation

SunWater, Queensland

Horticulture Australia Limited

Goulburn-Murray Water, Victoria

Harvey Water, Western Australia

Lower Murray Water Authority, Victoria

Ord Irrigation Cooperative, Western Australia

Gascoyne Water Cooperative, Western Australia

Grains Research & Development

Sugar Research & Development Corporation

South Australian Research and Development Institute

Western Australia Department of

Ever wondered how you are performing compared to others in your industry?

## Be part of the irrigation benchmarking study

An irrigation benchmarking survey carried out for the Australian cotton industry recently showed a 40 percent increase in water use efficiency (WUE) over 10 years.

Having seen the value of this data, the grains industry has joined the cotton industry to expand the collection of this important benchmarking information.

Water Smart Cotton and Grains is the new project funded by the National Program for Sustainable Irrigation, CRDC, GRDC and DEWHA which aims is to benchmark irrigation water use efficiency in terms of bales or tonnes per ML for the irrigated cotton and grains industries.

Water Smart Cotton and Grains is being headed by Janelle Montgomery, Water Use Efficiency Officer, I&INSW, based in Moree.

The previous survey, carried out by NSW Department of Industry and Investment (I&INSW formerlly NSW DPI) Irrigation Officer, David Williams, captured water use information from 36 cotton farms between Hillston and Emerald utilising the on-line benchmarking tool, Watertrack Rapid. (Spotlight Summer 2008 pp3-5).

It found the average Gross Production Water Use Index, (which relates production to the total amount of water used) was 1.13 bales per megalitre, rising from 0.79- or about 40 percent over 10 years since the last study.

This figure is representative of the cotton industry in 2006/2007 and can be used to benchmark water use so the cotton industry can gauge any improvement and identify the rate of improvement over time.



Dave Williams, left, surveyed 36 cotton farms to produce the last benchmarking study, providing the industry with up to date data on water use efficiency.



growers are urged to get on board.

Investment in the new project has allowed I&INSW to broaden this

The on-line benchmarking tool Watertrack Rapid will be used again in the new survey. It not only calculates a range of standardised performance indicators, but evaluates crop water use and estimates on farm

A number of private sector consultants have been trained in the use of Watertrack Rapid and will collaborate with I&INSW Irrigation Officers and collect water use information from around 60 cotton and 60 wheat irrigators located from Southern NSW through to Central Queensland, so as to benchmark irrigation water use during the 2008/09 cotton season and 2008 irrigated wheat season.

"We have already started data collection with over 30 farms already participating, but we will need a lot more farms to reach our goal of 60 cotton and 60 wheat farms", said Janelle Montgomery.

"Increased participation can only provide a better picture of water use practices in the irrigated cotton and grains industries.

"Ideally we would like to have all the data collected by the end of

Watertrack Rapid requires a variety of inputs most of which are easily extracted from numerous forms of farm records held with each grower. This data includes yield and crop area, several water input values (rainfall, soil water, storages, harvested, pumped), irrigation dates and soil type. It takes no more than two hours on-farm to collect.

Participants will be provided with Watertrack Rapid generated reports  $which include \, a \, water \, summary \, report$ and performance indicators report. The results from all participants will be collated anonymously so irrigators can compare their performance to industry and regional averages.

Comparisons of their yield, total water used, irrigation water used and total farm water losses can be made.

A number of irrigation performance indicators are also calculated including Gross Production Water Use Index, Irrigation Water Use Index and Crop Water Use Index.

"Cotton and wheat irrigators are urged to take part in the survey, which will help to improve individual performance and give the industry valuable benchmarks to work with into the future, while evaluating broad scale water use in irrigated cotton and grain farming systems," Janelle Montgomery said.

**?** For further information on how to participate please contact Janelle Montgomery, Water Use Efficiency Officer, Moree 0428 640990



## WATER



## Furrow irrigation keeps up with the best

The popular misconception that furrow irrigation is an inefficient system is disproven when efficiencies over 90 per cent are reported by top irrigators and researchers.

Janelle Montgomery, WUE Officer, I&INSW says "these high efficiencies are comparable with centre pivots and lateral move irrigation systems, but are only achieved with careful management of water at the field".

Optimum irrigation performance is achieved when both the application efficiency and distribution uniformity (DU) are high and the deficit has been suitably met (but not necessarily filled).

"We have found from field evaluations that improvements at the field level are often achieved with relatively simple and inexpensive changes in management, such as changing flow rates and cut-off times," Ms Montgomery said.

However, she points out that "undertaking a performance evaluation of your field is critical, as many growers seek to change their irrigation practices, it is imperative to ensure that any change is actually worth undertaking!".

So what are some of the key things that irrigators are doing to achieve application efficiencies over 90 per cent?

### Head ditch

- Consistently deliver sufficient water at an appropriate head;
- Maintain a constant flow rate;
- Maintain adequate freeboard (minimum of 0.15m); and
- Conduct regular maintenance (de-silting & weed control).

#### Siphons

• Siphon placement – operate under

submerged flow conditions, ie discharge under water level in the furrow stream;

 Siphon size — check internal diameter and length. It should be the same usually. Imperial sized siphons are specified according to their internal diameter and metric siphons according to their outside diameter. Internal diameter of metric siphons varied between manufacturers mixing these pipes causes variation in flow rate and can have significant affect on total water applied over an irrigation;

• Careful rotabuck placement.

#### ail drain

- Designed for rapid removal of storm waters to prevent in-field waterlogging;
- Deep enough to prevent water backing up but sufficiently shallow to prevent erosion between the furrow and drain.

Furrow irrigation efficiencies over 90 per cent are reported by top irrigators and researchers.

"these high efficiencies ... are only achieved with careful management of water at the field"



Janelle Montgomery, Water Use Efficiency Officer NSW Department of Industry and Investment

#### Irrigation scheduling

- Decide when and how much water to apply to maximise crop productivity;
- Plant, weather and soil based monitoring:
   Use a range of tools and indicators that you
   are comfortable with, however keeping a
   close eye on weather forecasts and visual
   inspection of the crop is still vital;
- Use Electromagnetic Induction (EM or EMI) surveying in conjunction with soil sampling to map soil variations across fields and farms. It indicates texture changes and the data can be analysed to produce maps of similar soil types. This can then be used to locate the "majority" soil type within a field:
- Use EM soil survey to locate soil moisture probes in a representative areas.

### **Water Application Checklist**

- Plan to have water on and off a field in no more than eight hours to minimise waterlogging, deep drainage and runoff.
- Manage flow rate and cut-off times to maximise application efficiency and distribution uniformity to reduce runoff, deep drainage and loss of nutrients.
- Infiltration opportunity time is the length of time that water is present on the soil surface for infiltration to take place. To achieve the best performance, the opportunity time for an irrigation should equal the amount of time necessary to apply the required depth of water.
- Application efficiency compares the amount of water applied and the amount of water

retained in the root zone, whilst DU is a measure of how evenly water has been applied.

- Low distribution uniformity is caused by an uneven opportunity time along the length of the furrow. The result is parts of a field being under-watered and over-watered. Running water longer to ensure sufficient water for the whole field is the most common cause of waterlogging to significant areas of a field, resulting in potential yield loss.
- A high application efficiency means that most of the water applied has remained in the root zone available for plant use. Low efficiency means much of the water has not reached or has moved out of the root zone and gives no benefit.
- Inflow rate typically has the largest influence of any variable that can be managed by the irrigator. It has a major impact on performance due to the speed of water advance down the field. A faster advance is typically more desirable on high infiltration soils.
- Along with inflow rate, time to cut off is a key variable easily managed by the irrigator. In fact, it is typical for these two variables to be managed together. Increased inflow rate is likely to result in excessive tailwater unless time to cutoff is managed accordingly.
- When inflow rate is increased, more precise control is typically required as it becomes easier to adversely affect performance when the inflow rate is high. For this reason, it is important to objectively evaluate your system performance, rather than simply increase the inflow rate without making any objective measurements.

This checklist has been compiled by Janelle Montgomery, Water Use Efficiency Officer I&INSW\*, Peter Smith Irrigation Officer I&INSW, Jenelle Hare Senior Technical Development Officer QPIF, DEEDI \*\* and John Doble of Gwydir Valley Irrigators Association

(\*)Department of Industry and Investment (formally NSW DPI)

(\*\*) Queensland Primary Industries and Fisheries, Department of Employment, Economic Development and Innovation (formerly Queensland Department of Primary Industries and Fisheries.)

**?** Further information: WATERpak Sections 2.9 & 4.2 Cotton and Grains Irrigation Website: http://www.cottonandgrains.irrigationfutures.org.au Cotton and Grains Irrigation Workshop Series



## Measuring bales (or tonnes) per megalitre? Go for GPWUI

Irrigation researchers now widely agree that the best way to compare water use efficiency is Gross Production Water Use Index (GPWUI). GPWUI water use index compares bales per ML (or tonnes/ML) between farms and regions.

This index takes into account the total amount of water used from all sources and includes irrigation water, rainfall and soil moisture. GPWUI also provides a benchmark for irrigators to gauge performance and fortunately, the inputs to the Index are readily extracted from farm records already held by most growers.

The records that need to be kept for year in, year out GPWUI reporting on water use efficiency are:

1) Yields – from ginning reports or grain receival dockets.

### 2) Water inputs:

- Water diverted the licensed metered water. The readings from your meters installed on your river pumps or bores.
- Volume of land surface diversions which includes stormwater runoff from fields, water harvested during storms or floods from the farm or adjacent land and rainfall on storages. Often this water is not metered, but can be estimated from pumping records and storage volume records.
- Storage Volumes storages should be recently surveyed and ideally have a calibrated gauge board or continuous logging storage meter installed. The more frequently storage levels are monitored the better harvested volumes can be determined.
- Starting and ending soil moisture deficit this can be measured in actual mm if soil moisture monitoring equipment has been calibrated or if soil cores are taken at the start and end of the season and volumetric water content determined. In most cases it is estimated from uncalibrated soil moisture data based on the soils full point and refill point.
- On-farm rainfall preferably from rain gauges located close to the cropping area.
- NB.The on-line benchmarking tool Watertrack Rapid requires a few other inputs as it also calculates crop water use, effective rainfall and on farm water losses.



### WATER & DRAINAGE



Mark Silburn from QLD
Department of Energy and
Resources, UNSW Water
Research Laboratory's PhD
student Anna Greve and
CSIRO Soil and Landscapes
Research Group Leader Dr
Anthony Ringrose –Voase in
the paddock at the forum.

## Diving deep into drainage research

Over the past decade, with support from CRDC, researchers have been uncovering the truths about deep drainage and developing methods for measuring and managing the impacts.

Deep Drainage (DD) is water that traverses the crop root zone. Once gone, it is lost for productive use and may negatively impact surface aquifers and off-farm. Now a group of dedicated researchers are embarking on the next stage of deep drainage study for the benefit of the whole industry.

In 1999, a group of research and industry people gathered to discuss water balance in irrigated cropping systems. They identified priorities for research and set about to change the way the industry thought about deep drainage.

Fast forward 10 years to May 2009, and a group (of 36 researchers, extension officers and industry people) meets again to discover just how far they had come, and to set themselves some new goals.

According to CRDC Program Manager, Helen Dugdale, the 2009 forum participants were heartened by the progress that had been made.

"The past 10 years have seen a shift in growers' approach to deep drainage and our methods for understanding and measuring it have advanced considerably," she said.

"Ten years ago most cotton irrigators didn't really think deep drainage was an issue, especially in the heavy clay soils. However, research in the last 10 years has shown that deep drainage certainly occurs in these soils.

"Growers are much more conscious of deep drainage and adopting water use efficiency methods. We now need to extend this general understanding into better practices."

The 2009 forum allowed researchers to meet and provide an update of their latest research. A list of priorities for future deep drainage (DD) research and extension was developed.

#### **DD Research Priorities**

Moree-based water use efficiency officer Janelle Montgomery said one of the highest research priorities identified was to improve understanding of the water movement below the root zone.

In particular, how fast does water move through the regolith, (that zone between soil and underlying rock) and when does deep drainage become recharge of aquifers?

"We have a good understanding of what drives deep drainage and we're good at measuring ground water response, but we realise there is a whole section of dirt that hasn't been explored — the area called the vadose zone — which is anything under the root zone and above the ground water table," she said.

"We want to put more resources into understanding what's happening in that zone."

Another priority was to measure the Total Water Balance for a cropping system. Deep drainage has been measured in isolation, but there are few studies that have tried to measure all components of the water balance.

"We want to measure water input (rainfall and/or irrigation), runoff, evapotranspiration, deep drainage and soil water storage. Closing the water balance provides a check of the deep drainage measurements," Ms Montgomery said.

For this to be done, another important area that still needs to be further progressed is the understanding and estimation of Evapotranspiration (Et).

"There is still some confusion and uncertainty surrounding Et and it can be hard to measure, especially at the catchment level," Janelle says.

"The groundwater modellers need better spatial measurements of evapotran spiration."  $\,$ 

She said a greater understanding of how irrigators can use Et to estimate crop water use is also required, so we still need further extension in this area.

"We've really been pushing the idea of calculating and monitoring crop Et. It's such an important part of getting maximum efficiency from irrigation scheduling.

## Deep drainage myth busters

The Cotton CRC Water Team recently sought the response of some of the industry's leading deep drainage researchers on these Deep Drainage "myths" – Anthony Ringrose-Voase and Richard Stirzaker (CSIRO), Willem Vervoort (Sydney University), Des McGarry, Mark Silburn and Jenny Foley (QNRW).

Find out why these myths have been proven false. Read more at http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/30 12684 ENA HTML.htm

Myth 1: When I irrigate throughout the season the soil seals, reducing infiltration - so I don't have deep drainage. FALSE!

Myth 2: Groundwater tables have been falling over the last few years, so I mustn't have deep drainage. FALSE!

Myth 3: My soil moisture measurement tool does not show a change in soil water levels at depth throughout the season - this means deep drainage is not occurring. FALSE!

Myth 4: My water storage does not leak so deep drainage is not an issue when I irrigate. FALSE!

Myth 5: I irrigate efficiently by maintaining high heads and pulling siphons as they come through so no deep drainage occurs. FALSE!

"I'm always surprised that more growers aren't using it in combination with other scheduling tools such as soil moisture monitoring and visual inspections."

Other research priorities that came out of the forum was to simply make the most of available data – for example, deep drainage trials where possible should be run with other related trials, such as precision ag trials where yield monitor data is collected. In this example deep drainage results can be related to differences in yield and Et along the length of an irrigation field.

The final research priority was the need to keep salinity thresholds and water quality guidelines on the research agenda

### **Deep Drainage Extension Priorities**

The highest extension priority related to growers wanting a better understanding of what defines too much or too little deep drainage.

Too little relates to the soil leaching fraction to ensure there is no build up of salts. What defines "too much" is more questionable — the forum suggested a base amount of 10mm/irrigation event and that anything greater than this was an economic decision by the grower.

However, it was also suggested that in some instances there can be an amount of drainage that we can't do much about as it is due to bypass flow.

Extension material needs to be developed to improve growers understanding of these amounts.

The forum included discussion about how much deep drainage researchers were finding and the affects of farm management. In most instances deep drainage was between 100 and 200mm per year. However, more recently drought has lowered this number. The ACRI lysimeter this year recorded less than 50mm. This was because the first irrigation was not until Christmas due to

good rain early in the season, and because the subsoil was particularly dry going into the season.

The principles that drive deep drainage are the soil water deficit, which increases between irrigations as the crop develops, and the incidence of rain.

Rain can reduce or increase drainage depending on when

Immediately after an irrigation, rain will add to drainage. However, if rain reduces the frequency of irrigation, it can also reduce drainage as the amount of rain received in a short time is generally much less than the amount applied during an irrigation event.

The research is repeatedly seeing high deep drainage early in the season and lower deep drainage at the end of season.

Climate variability and water management have a large influence on the amount of deep drainage.

The other important extension priority was to develop a deep drainage calculator and/or guidelines so irrigators can quickly estimate their deep drainage in order to assess if management changes are required.

Over time research findings will be built into BMP and the WaterPak manual.

#### Making important connections

Ms Montgomery said that perhaps one of the most positive aspects to come out of the 2009 forum was the opportunity for researchers to share information.

"There is such a wealth of information and data out there. People might still be writing up their studies, but forums like this can really help researchers collaborate; make connections and cross-pollinate their ideas," she said.

"Working together like this can really advance our knowledge as an industry so much further."

## Understanding Et

The term 'Et' is probably most commonly known as the extraterrestrial who, in the movies, wanted to "phone home"... but in studies relating to agriculture Et is something else altogether. Unfortunately for many growers, Et is still a little "alien"!

Evapotranspiration (Et) is a collective term for the transfer of water, as water vapour, to the atmosphere. It represents the combination of two separate

Evaporation, where water is converted from liquid to vapour and lost from the soil and plant surfaces; and

Transpiration, where water is lost from the crop through the vaporisation of water within plant tissues and its subsequent loss through the small openings on the plant leaf surface called stomata.

Jenelle Hare of QPIF, DEEDI\* and Cotton Catchment Communities CRC says that understanding Et is "another tool in the arsenal that growers can use to gain information on their crop's water requirements".

In her article "Using evapotranspiration (Et) to estimate water use" she outlines some ways that growers can estimate or measure the volume of water used by the crop using evapotranspiration.

"Crop water use can be estimated or calculated through the use of Et data. Data can be obtained from the Bureau of Meterology SILO website or from on-farm automatic weather stations," she says in the article.

"A point to bear in mind is that the crop evapotranspiration is the demand that must be met by in-season rainfall, irrigation and stored soil water at sowing."

Don't let Et continue to be an 'alien' concept to you. Read more about using Et in article by Jenelle Hare http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/26\_9829\_ENA\_HTML.htm or talk to your local extension officer.

\*Queensland Primary Industries and Fisheries, Department of Employment, Economic Development and Innovation (formerly Queensland Department of Primary Industries and Fisheries.) 24 **Spotlight** Spring 2009 Spring 2009 Spotlight 25



## New-tech leaves farms safer

By Mary Ann Day

and learning from

Introduction of new technologies has

vastly improved the safety on cotton

farms over the last 10 years a new

The study investigated the health and

safety impacts of biotechnology and

other factors on health and safety in

the Australian cotton industry. It

concluded that biotechnology has

resulted in a major impact that has

reduced the health risk of exposure to

hazardous insecticides and the safety

Introduction of GM technology

and a range of other technologies

including; GPS, improved machinery

design, IPM and agronomy, and the

development of less toxic pesticides all

pointed to a safer work environment

Helen Dugdale, Research Program

Manager with CRDC assisted the

research effort through providing

access to valuable documents and data

for the report. She said that 10 years

ago farms were a lot more dangerous

and this study has shown that health

The report's authors John Temperley

and safety is now much improved.

on today's cotton farm.

impact of less traffic on farms.

each other.

Agricultural Health and Safety, University of Sydney at Moree. The Centre received research investment from CRDC.

John Temperley said farmers in the study reported their work less stressful as a direct result of new technologies. "Fewer chemical sprays thanks to GM cotton means less tractor work. Less weed chipping and less exposure to the sun and other outdoor issues also has direct and measurable impacts that the study now reveals conclusively.

"The study also found improvements in safety in a number of key areas, which were related to factors such as vehicle and on-farm traffic, irrigation systems; cultivation technology; pesticides and pesticides application technology; harvest technology; GM technology and adoption of farm OHS management systems," Mr Temperley said.

"But while GM technology has had a highly significant impact, its effects are not as clearly demonstrated here as in other countries where human pesticide poisoning events are more common.

and Lyn Fragar are researchers "We were not looking at the with the Australian Centre for environmental aspects in this report,

but the reduction of pesticide use is fantastic, as is the increase in farm safety — which is good news for the cotton industry."

The research, carried out as a desk top study, used available reports and data. Key people consulted included growers and agronomists associated long-term with the industry, who provided information from their own experience.

During the first three to four decades of cotton production there were a wide range of safety hazards reported, mostly relating to mechanical hazards and potential chemical hazards.

"The cost of injury in cotton production was estimated and reported for cotton farms in Queensland in 1994 (Ferguson, 1994). In that survey of cotton farmers, the cost of injury/illness was \$53,426 per 100 farms," said Mr Temperley.

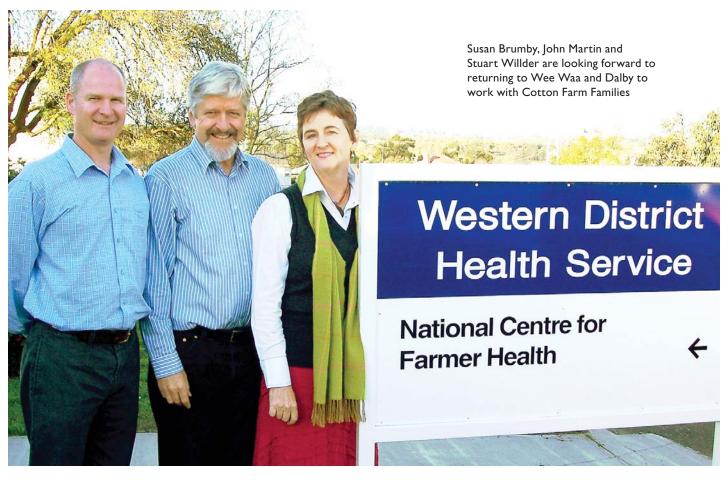
"Mobile plant and equipment, machinery and non-powered hand tools and equipment were most commonly associated with injury claims in the period between 1997/98 and 2005/06.

"There have since been many changes in a number of key areas.

"Machinery and tractors in particular are now more operator-friendly, offering better comfort, less vibration, less noise. This all leads to increased productivity."

The researchers have made a number of recommendations including:

- Higher-order solutions should be found and put in place, such as ensuring exposed moving machinery is guarded. Some high risk hazards remain in the industry and must be managed.
- There would be benefit from collective activity by cotton producers for: benchmarking OHS safety performance and learning from each other. Entry-level worker safety induction; setting of safety standards for contractors, and maintenance of a pool of contractors that meet those standards, is recommended.
- 7 The impact of biotechnology and other factors on health and safety in the Australian Cotton Industry: available from the Australian Centre for Agricultural Health and Safety, Email:aghealth@health.usyd.edu.au



## Looking back, moving forward – sustaining farming families

CRDC is going back to the future through the running of new Sustainable Farming Families Future Directions workshops.

The pilot course was first staged in 2006-07 in Wee Waa and Dalby, with excellent attendance and glowing reviews from participants.

The latest round of workshops will be the third since 2006.

CRDC's Helen Dugdale said the original workshops and subsequent

follow-ups were a tangible, industryleading example of how to get the crucial message of farming family health and wellbeing to farming families in the most effective way.

"We are very excited to obtain the investment to run this extra workshop in Wee Waa and Dalby and to have organisers Susan Brumby, John Martin and Stuart Willder back with us," Ms Dugdale "These extra workshops will help give vital feed-back to individuals involved and also to industry on the health outcomes and viability of a program like Sustainable Farming Families, for people involved in growing cotton"

"A hands-on workshop with a further physical assessment and check up, where questions can be asked and answered, will help ensure the unique demands of the agricultural lifestyle and work environment can be successfully managed."

The workshops will be held on March 2 in Wee Waa NSW and March 3 in Dalby.

The SFF Future Directions is funded by the Rural Industries Research Development Corporation Cooperative Partnership for Fishing and Farming Health and Safety.

? Helen Dugdale CRDC 02 67924088, helen.dugdale@crdc.com.au

## Workshops on climate change and leadership

By Mary Ann Day

The Voices in Agriculture — Women Leading Change Program is proving an ideal opportunity for women who want to embrace and create or lead change.

Leadership of our rural communities and the impact of climate change are two issues needed to build vibrant and resilient communities, says long-standing WINCOTT member and CRDC Research Program Manager Helen Dugdale.

Three new workshops on leadership skills and climate change, are being held by WINCOTT (Womens Industry Network – Cotton) in November in the Namoi Valley, Darling Downs and Macquarie Valley. They will be in Dalby on 18-19 November, in Gunnedah on 21-22 November and Trangie on 23-24 November.

The Voices in Agriculture - Women Leading

Change Program is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under its Australia's Farming Future program and is managed by WINCOTT.

"This is a great opportunity to learn more about climate change and to develop skills," Ms Dugdale

"This is the first time we have addressed climate change through our workshops.

"We have run leadership workshops before with the same facilitator, Jo Eady, and everyone has benefited and gone on to do wonderful things in their career and in their community."

The Voices in Agriculture – Women Leading Change Program seeks to provide participants with skill development and experience through the identification and development of a project goal. During the program women will meet for two face to face forums, develop a partnership with a mentor, receive one on one support from a specialist facilitator as they implement their project goal and also organise a celebratory dinner, which will be open to people from across the community.

Also good news is that the program has become more affordable.

"As the program is heavily subsidised, we have been able to reduce the cost to participants down to \$140," added Helen.

The program commences in November 2009 and concludes in February 2010.

**?** If you are interested please ring Helen Dugdale for an application form on 02 67924088, or send an email to: helen.dugdale@crdc.com.au

26 **Spotlight** Spring 2009 Spring 2009 Spotlight 27



The Council of Rural Research and Development Corporations' Chairs has appointed Su McCluskey its inaugural chief executive officer.

As chief executive, Ms McCluskey will help drive the Council's agenda - assessing the economic, environmental and social impacts of RDC investments, identifying opportunities for cross-RDC collaboration, supporting national R&D planning and enhancing efficiency.

Australia's 15 Rural Research and Development Corporations conduct research across every part of Australian primary industry and are funded by a co-investment model based on industry levies and government money. In 2008 this investment was worth about \$540 million, including \$230 million from government.

In December 2008, an independent evaluation found that for a group of 32 randomly selected RDC projects, every \$1 invested delivered \$11 in total benefits to farmers and the wider community.

"Ms McCluskey has broad policy experience, especially in taxation, regulatory and rural affairs, and is superbly qualified to take on this role and drive the Council's strategic direction," said Mr Enzo Allara, chairman of the Council of Rural Research and Development Corporations Chairs.

Executive Director, Bruce Finney, (L) and Rohan Boehm, CRDC Communication Manager, welcomed Rural R&D Corporations' Chief Executive Officer, Su McCluskey to Narrabri in October to be briefed on cotton R&D. During her visit, Ms McCluskey visited ACRI. She met with researchers and was briefed on a broad range of key research projects. She also met with cotton producers and CRDC research managers during her full day of cotton industry briefings..

## New CEO for Rural R&D Corporations

Ms McCluskey is the immediate past Executive Director of the Office of Best Practice Regulation where she was responsible for implementation of the Australian Government's regulatory reform agenda including a new regulatory framework, strengthened impact assessment and review mechanisms.

She was also a Consultant Specialist Advisor in the Department of Industry, Tourism and Resources' Office of Small Business.

Prior to this, Ms McCluskey held senior policy positions with the Business Council of Australia, the National Farmers Federation and the Australian Taxation Office.

## Cotton plays key role in farming and fishing safety partnership

Rural industries including the cotton industry are getting a helping hand from a collaborative partnership set up for Farming and Fishing Health and Safety in a bid to improve the safety environment and work practices in these industries.

Managed by the Rural Industries
Research and Development
Corporation, the Collaborative
Partnership for Farming and Fisheries
Health and Safety project has met
recently to discuss how farming
and fishing industries can be helped
through funding for key projects.

Helen Dugdale, Research Program Manager, with the CRDC, explained the new collaborative partnership's aims: "Agriculture has one of the highest rates of workplace health and safety incidents of any industry in Australia.

"The Collaborative Partnership for Farming and Fishing Health and Safety, aims to invest in research and development to improve the physical and mental health of farming and fishing workers and their families and improve the safety of the environment and work practices in farming and fishing industries.

"A small amount of money from each

RandD corporation can go a long way when we are in a national committee, so this program will benefit farmers across a number of industries.

"The project has been running a few years and recently published a 'plain English' compendium of recent farm health and safety research."

This outlines the valuable work completed by the Joint Venture in Farm Health and Safety between 2002 and 2008, and is an important tool in the dissemination of research results

"This is a great opportunity for us to develop strong cross-sectoral collaboration to support high quality research and development," Ms Dugdale says.

#### Key long term strategies

The research objectives of the program are to develop strong cross-sectoral collaboration to support high quality research, development and extension that will improve:

- the physical and mental health of farming and fishing workers and their families;
- the safety environment and work practices in farming and fishing industries

## Adoption and Communication

The program will be focused strongly on adoption and generating changed attitudes of farmers and fishers towards health and safety issues in the workplace and living environment. As a first step in this process, the program will facilitate understanding of the existing and potential adoption pathways whereby the level of awareness of health and safety issues, current attitudes and practice changes can be modified. It is anticipated that the program itself will experiment with a number of alternative pathways for adoption of existing information.

The new program will also provide a stronger focus than in the past on evaluation and identification of what methods have been most and least successful.

Projects will be expected to incorporate an adoption/communication strategy to ensure that outcomes are achieved with the target audiences.

#### Future challenges

One of the major challenges is that a change in safety culture (beliefs and values) is required within farming and fishing in order to minimise accidents, injuries and fatalities.

Moreover, some approaches to work-related health and safety are in conflict with farmers attitudes of autonomy and self-reliance.

The key challenge therefore is not so much to generate new health and safety knowledge, but to bring about change given the existing knowledge. This may require a mixture of awareness-raising measures including using messages that contain low-cost practices that improve safety, targeting of specific farming and fishing sectors with specific messages, and highlighting knowledge of risks and costs of farming and fishing health and safety.

Above all, is the challenge of developing new ways in which messages about health and safety can be best packaged and delivered.

The changing demographics of the structure of farming and its workforce may also be challenging in terms of anticipating and targeting new sectors and issues where the largest gains can be made with limited resources.

? Helen Dugdale CRDC 02 67924088, helen.dugdale@crdc.com.au

## New crop of future leaders on the way

By Mary Ann Day

A select group of 10 people from NSW, Queensland and Victoria representing different sectors of the cotton industry are being given the chance to improve their leadership skills through the 2009-10 Australian Future Cotton Leaders Program (AFCL).

AFCL is an initiative of Cotton Australia and CRDC, and has been a great success since its inception in 2007, according to organisers and participants.

"The idea of the program is to develop leadership skills and encourage participants to take leadership positions in their respective industry or community by building up their confidence and leadership skills," explains Helen Dugdale, CRDC Research Program Manager.

The course runs over one year and those taking part undertake integrated industry leadership projects to put their skills into practice.

Program facilitator Jo Eady said a major reason for the success of the program was because it has been embraced by industry.

"As part of the experience it is imperative for participants to interact closely with industry – individuals, organisations and companies," Jo Eady said.

"We have always had support from current leaders and industry sectors, without which the program couldn't exist.

"And the cotton industry has its fair share of recognised leaders in their fields, from policy and research to production and marketing, who have so much to offer leaders of the future."

This year five men and five women, some of whom are farmers, cotton merchants, two extension officers and one researcher, are part of the program.

Participant Sinclair Steele is the 27-year-old branch manager of Ag nVet in Warren, NSW.

As branch manager of AgnVet services, improving his leadership skills is important to his role.

"We each have a project to complete and mine is aimed at developing a communications audit and creating a strategy for staff here at Warren," he explained.

"I have been in this job for two years and we have just rebuilt the team, so this is an opportunity for me to develop a leadership role to interface with cotton growers in the area.

"This course has been a eye opener. It

has helped me to see how many people rely on the cotton industry in this area. It has also been really useful for developing contacts within the industry."

Elissa Wegener, 22, is a Marketing Services Officer with Queensland Cotton in Dalby.

"My project is looking at sharing ways for people passionate about the cotton industry and to get involved by identifying what opportunities exist and sharing the experiences of other people," Elissa said.

"The program provides me the opportunity to be more involved in the industry and has helped to develop my leadership skills.

"It's been great so far and I've not only enjoyed the chance to meet new people from across the supply chain, but from different growing regions as well, which can be difficult.

"The Australian Future Cotton Leaders Program is really helping me to broaden my horizons and get more involved in the industry."

7 Jo Eady 0419 912 879 jo.eady@bigpond.com Helen Dugdale 02 6792 4088 helen.dugdale@crdc.com.au



Australian Future



Future Cotton Leader Elissa



Future Cotton leader
Sinclair Steele at his Warren
workplace.

## What the CCA surveys tell us about the cotton industry

By Chrissy Brown

Independent surveying carried out by the CCA (Crop Consultants Australia) in their annual post season consultants survey is becoming increasingly valuable to the CRDC and Cotton CRC for evaluating on farm adoption of R&D project outcomes and the corresponding impact on economic and environmental performance of the cotton industry.

CCA surveys cotton consultants from all of Australia's major cotton growing regions capturing important information on a large area. With data being collected now for over 20 years the annual survey is providing the industry with important information regarding seasonal and long term trends in pesticide use, water use efficiency, management practices and adoption of R&D outcomes.

CRDC's Bruce Pyke explains that information provided by the surveys about adoption of R&D and changes in management practices assists the CRDC determine how well past R&D investment has hit the mark, how well results have been extended to growers and how CRDC can improve these areas

in the future

He said results from the survey also assist the CRDC evaluate return on investment from R&D projects and provide data for benefit cost analysis

Further highlighting the value of the long running CCA Survey series Mr Pyke says he believes that it has enabled the Australian cotton industry to lead the world in demonstrating that introducing Bt and Roundup Ready cotton varieties resulted in a large reduction in industry pesticide use.

"Long term trends in data collected also reveals that progress continues to be made in both GM and conventional cotton production to improving management practices that reduce environmental impacts," he explained.

"Appreciating the significant value of the surveys' independent data, the CRDC and Cotton CRC have jointly funded the CCA surveys in recent years.

"By contributing to the survey's design CRDC hopes to further increase its value by taking a more strategic long-term approach to many of the survey questions for continuity and follow up data."

By participating in the CCA surveys, consultants and growers have a great opportunity to provide CRDC and Cotton CRC with feedback on crucial issues they would like addressed.

CRDC Program Manager Helen Dugdale said a number of issues are being followed up after receiving feedback from the 2008 CCA surveys.

"Consultants and growers would appreciate more information about climate change and minimising greenhouse gas emissions from cotton production," Helen said

"There have also been suggestions about improvements to BMP to make it more streamlined and linked to profitability. "As a direct result of survey feedback CRDC is looking into developing short courses and increasing publicity on issues including impacts of climate change and information on staffing issues."

Results from the 2009 CCA Consultants Survey are being released soon and a Spotlight article featuring highlights in December.

Customers needs are always changing and according to CRDC Value Chain Investment Manager Dallas Gibb, "to remain competitive it is essential that the cotton industry understand its customers' needs and how Australian cotton matches these needs".

# Global survey of customers' needs

The industry has conducted a number of international surveys over the last five years to identify the true place for Australian cotton fibre.

A collal CRC v agronor maturit

These began with CRDC co investment with the Australian Cotton Shippers Association (ACSA) and the Australian Cotton CRC in the project Quality Issues for Australian Cotton from a Mill Perspective.

This 2004 survey provided an important benchmark of customers

"A key aspect to this survey is that it involved both a subjective questionnaire of our key mills customers as well as objective assessment of actual raw cotton and yarn samples used by the mills," CRDC Value Chain Investment Manager Dallas Gibb said.

"This gave a far better understanding of a what type cotton is being used for selected fabric types and how Australian cotton compared with other cotton types."

Outcomes from the 2004 project assisted the Australian industry in determining the needs and perceptions of our customers, which are mainly spinning mills in South East Asia, China and India.

While the overall report card from local and international spinners was good, the survey found that Australian fibre has a number of issues that need attention. Nep and short fibre content levels and micronaire (too coarse) were key concerns.

The survey report laid the foundation for the majority of post harvest/value chain R&D over the past five years.

This included an expansion of ginning research to investigated methods to reduce nep generation during ginning and lint cleaning.



Pete Johnson and René van der Sluijs in an Isumiya store in Osaka, Japan examining garments made from 100% BMP Australian Cotton

A collaborative project with Cotton CRC was then initiated to assess agronomic factors that affected fibre maturity, a key factor affecting neps in final fabrics.

In 2007 the industry conducted an independent survey of key mills. This time the focus was to better understand demands for high quality cotton types and customer understanding of the Industry Best Management Program (BMP) that linked environmental management to production

Mr Gibb said that the outcomes from this survey highlighted the potential to establish niche premium markets for new high quality cotton varieties being developed.

"As a result, the industry established the Premium Cotton Initiative which is aimed at understanding the potential market for longer staple upland cotton fibre, produced under the Best Management Practice program," he said.

It was evident from the two previous surveys that Australia continues to face stiff competition in export markets from growths from the USA (mainly SJV and Fibermax), Brazil, West Africa and CIS, as well as from synthetic fibres.

"In conducting the next industry survey we would like to expand on the outcomes of the 2007 survey as well as collect data in the same manner as the initial 2004 survey," Mr. Gibb said

Researcher and Textile Technologist René van der Sluijs, from CSIRO Materials Science and Engineering who is heading the current project, agrees, saying that in order to maintain and improve its position against overseas growths and synthetic fibres, the Australian cotton industry needs to understand how Australian cotton is currently being used, and importantly identify potential changes that have occurred in consumption trends from the previous surveys.

"This will allow the industry to know how it can best position Australian cotton to ensure it meets the changing requirements of our customers," he said.

The 2009 Mill Survey is attempting to answer these questions by surveying spinning companies across the globe. The survey requires CMSE staff to visit ACSA-nominated spinning mills to conduct one-on-one interviews with relevant mill personnel.

Interviews are based around a standard questionnaire formulated by CMSE in conjunction with ACSA which will seek to determine the specific strengths and weaknesses of Australian cotton fibre quality.

Mr van der Sluijs and Pete Johnson of Left Field Solutions have already visited spinning mills in Japan and South Korea and will also visit mills in Indonesia, Thailand, China, Hong Kong and India.

In June Mr van der Sluijs and Mr Johnson accompanied by Mr Kazuya Kuroda, Senior Business Development Manager of Austrade visited the Kurabo Ltd, Fujibo Textile, Toyobo Co. Ltd, Shikibo Ltd, Kondobo Co Ltd and Toyoshima Co Ltd mills in Japan.

"Our survey participants accounted for nearly 60 percent of the installed spinning capacity in Japan and consume approximately 32,000MT per annum, producing in excess of 31,000MT of cotton yarn," Mr van der Sluijs said.

"Japan has long been a major market for Australian cotton and the participants were very happy to answer the survey questions."

In South Korea accompanied by Mr KI-OK Kim, Senior Business Development Manager of Austrade, visits were made to survey Dong —IL Corporation, Ilshin Spinning Co. Ltd, Kuk IL Spinning Co. Ltd and Kyungbang Limited.

Survey participants accounted for just over 55 percent of the installed spinning capacity in Korea and consume approximately 104,000 MT of cotton per annum and produce approximately 95,000 MT of cotton varn.

"These participants were thus able to provide a complete picture of the Korean market and were quite forthcoming with their responses to the survey questions and general conversation," Mr van der Sluijs said.

The Mr van der Sluijs and Mr Johnson will travel to Thailand and Hong Kong in September to conduct the survey.

Information gained from the interviews will be backed up by data from testing fibre samples collected from each mill.

It is envisaged that four sets of fibre over the (2009/10) crop year would be collected and tested.

As part of the initial contact with mills a formal sampling procedure was demonstrated so that mill personnel can collect the fibre samples independently over the crop year.

It is hoped that preliminary results will be available in early 2010.

Rene van der Sluijs rene.vandersluijs@csiro.au 0408 885 211; 03 5246 4000 Dallas Gibb, dallas@techmac.com.au 07 4638 5278 Pete Johnson; 0409 893 139

pete.johnson@leftfieldsolutions.com.au

# Pro-active approach needed to read market signals



**VALUE CHAIN** 

Pete Johnson, chair of the Premium Cotton Initiative Working Group

By Melanie Jenson

Retail branding may be a way to create demand pull for Australia's high quality cotton, as would greater dialogue with spinners, knitters and manufacturers.

As part of the Cotton Research and Development Corporation's strategic R&D plan, greater investment is being made in "post farm gate" research — including development of demand pull strategies for Australian cotton fibre.

Overall aim is to create strategies to generate greater value within the Australian cotton fibre for the benefit of all supply chain participants.

The Australian Cotton Industry's investment in farm productivity and its Best Management Program (BMP) has resulted in very large efficiency, environmental and production gains at the farm level.

As a result Australian growers have enjoyed a reputation for leading the world in the sustainable production of some of the highest quality (upland) cotton available. However, with increased global competition for premium cotton types, the industry is seeking to develop collaborative links with domestic and/or international processors and brand owners to help secure, improve and share the premiums gained for Australia cotton.

The "We're Aussie, Wear Aussie" forum earlier this year was part of CRDC's Value Chain Investment Program and brought a wider high level of the supply chain audience together to challenge a number of assumptions the industry has made over potential market leverage points for our fibre.

The outcome of the forum has posed a number of questions and challenges for the industry.

"In terms of branding/marketing we need to clearly identify the problem we are trying to solve, and who we are targeting," says Pete Johnson, chair of the Premium Cotton Initiative Working Group.

"And considering we are marketing to both our customers (spinners) and to consumers (retail purchasers) we need to generate one central positioning that can be easily modified for both audiences, but essentially hinge on one clear message about Australian cotton."

By enhancing communication, business linkages and or product ownership there is potential to "shorten" supply chains and improve market signals and/or sharing of value through supply chain.

This has resulted in the development of supply chain maps via the mill surveys - this is progressing well, with a comprehensive map developed for cotton spun in the Korean market and marketed as yarn, fabric and textiles globally.

"We need to discuss and communicate developments with all stakeholders to ensure good two way information flow," says CRDC Value Chain Investment Program Manager Dallas Gibb

"We need to develop a proactive approach toward textile/fashion market signals."

Prior to this year's forum, this proactive approach was taken by Cotton Australia and ACSA who had already developed strong relationships and demand for Australian BMP cotton in Japanese markets.

"In recent years our efforts have been targeted at local brand owners working to show them that using Australian BMP cotton can potentially give advantages with local consumers," says Cotton Australia CEO Adam Kav.

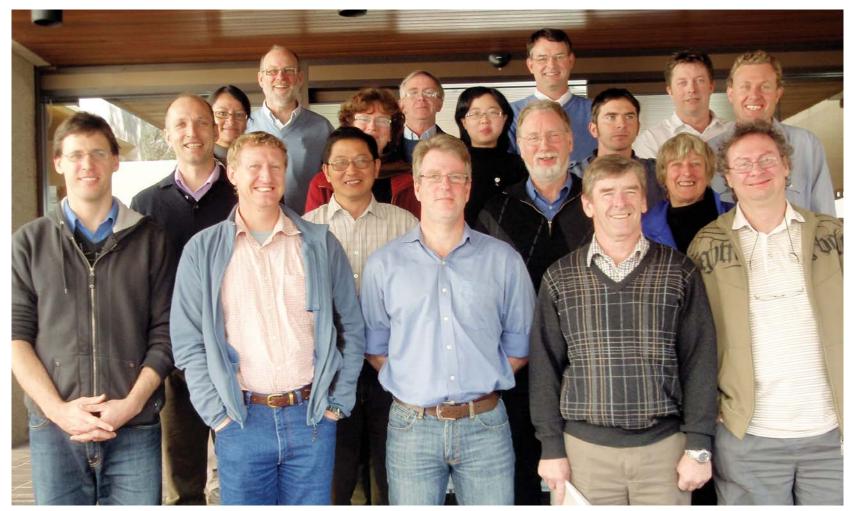
"This forum helped to show the local brand owners in attendance that the whole of the Australian supply chain from the grower onwards is committed."

**?** Contact: Peter Johnson petejohnson@leftfieldsolutions.com.au

## Key outcomes from the 'We're Aussie:Wear Aussie' forum were:

- Retail branding efforts are a key factor in developing premium products beyond traditional commodity markets
- Branding efforts should focus on a lifestyle relevant to the consumer rather than a process relevant to the retailer/manufacturer.
- A swing tag/brand identifying
   "Australian Cotton" products is
   considered a potential marketing
   advantage by brand-owners
- "BMP" is not a brand that can be marketed – but it is an integral part of the Australian cotton story that will help secure product integrity for quality and environmental assurance.
- Raw cotton quality is relevant as a selling point to spinners, but more research and effort is required in understanding of fabric outcomes before we can effectively market Australian cotton further down the supply chain to brand owners and retailers.





Leaders in the fibre field at the CSIRO workshop recently were: (front) Dr Rob Long, Dr Michael Bange, Rene van der Sluijs, Dr Greg Constable, Dr Danny Llewellyn. Second row - Dr Stuart Gordon, Dr Shiming Liu, Dr TJ Higgins (Theme Leader), Dr Liz Dennis. Third row - Dr Colleen Macmillan, Dr Rosemary White, Dr Qinxiang Liu, Dr Yves Al-Ghazi, Dr Warwick Stiller. Fourth row - Dr Geoff Naylor, Dr Jeremy Burdon (Plant Industry Chief), Dallas Gibb, Kevin Bagshaw.

## Fibre science explored

In July CSIRO researchers from Narrabri, Canberra and Geelong involved in cotton fibre science related initiatives met in Canberra for the third annual workshop.

"The workshop provides an excellent forum for researchers to review progress and report on current research, to identify research gaps and new opportunities and to ensure synergies in CSIRO research activities across disciplines," said CSIRO Sub-Program Leader of Genomics and Plant Development Dr Danny Llewellyn who coordinated the meeting.

Research was discussed on a number of diverse topics ranging from new measuring instruments, molecular biology, plant breeding, crop physiology, crop management, ginning and spinning.

Theme Leader and Deputy Chief, CSIRO Plant Industry Dr TJ Higgins said the workshop provides researchers an opportunity to present their research outcomes in detail and to have vigorous and open discussion on results and their implications for cotton production, processing or breeding.

A number of areas were outlined for potential industry investment.

These included how best to use improved seed and fibre properties in the production of premium fabrics

and the development of tools and technologies that allow cotton processors, gins and mills, to better realise the value of Australia cotton.

Dr Greg Constable, CSIRO's Stream Leader for Industrial Fibres from Cotton, also attended the meeting and said a highlight of the workshop was a presentation summarising detailed studies on wood fibre structure.

"This research capability, originally in CSIRO Forestry and now in CSIRO Plant Industry identified some opportunities for collaboration with cotton in the molecular area where there may be some similarities in the genes and biochemical process leading to both cotton and wood fibre growth and cell wall properties," he said.

Dallas Gibb, Program Manager Value Chain Investment, attended the meeting on behalf of the CRDC and Cotton CRC.

"The workshop provides an excellent opportunity to discuss recent developments in cotton fibre research while allowing research to meet and discuss areas for greater collaboration," Mr Gibb said.

characteristics, escent developments in cotton fibre research while allowing research to meet and discuss areas for greater collaboration," Mr Gibb said.

"The link between fibre quality and yield is an obvious area of research that CSIRO has paid particular attention.

"Despite the complexity of understanding the relationship between yield and quality, some excellent progress has been achieved in identified genes for fibre development."

Some key areas of research discussed were:

- Gene action and fibre growth.
- Developments of potential premium fibre varieties
- Association between fibre maturity and neps.
- Progress with the Cottonscan instrument for measuring cotton linear density.
- Modifications to gins to reduce fibre damage.
- Spinning trials in India with Australian premium fibre.
- Discussions around the measurement of fibre properties not routinely measured but which have significant affects on fibre processing characteristics, eg fibre elongation, moisture content etc.
- Rene van der Sluijs rene.vandersluijs@csiro.au 0408 885 211; 03 5246 4000 Dallas Gibb dallas@techmac.com.au 07 4638 5278

# Evaluation of energy use in ginning

The quest to measure energy use in cotton production systems has been expanded to the ginning sector.

The work undertaken by the National Centre for Engineering in Agriculture (NCEA) involves Ms Siti Amni Ismail, Dr Guangnan Chen, Craig Baillie and Troy Symes with support from CRDC and the Australian Cotton Ginners Association.

The broad aim of this work is to identify the overall energy usage and cost contribution to processing inside a cotton gin and to inform future improvements in energy efficiency.

Based on information obtained from six cotton gins, average energy use (electricity and gas) and cost per bale has been determined

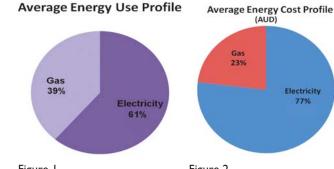
Improving energy efficiency for key processes is currently being investigated through further detailed monitoring at select sites.

"Besides saving power, energy efficiency provides a significant opportunity for ginners to reduce operating costs and maintenance throughout the year. By default this also reduces the associated Greenhouse Gas Emissions (GHGs) or carbon footprint which is emerging as a key consideration for product differentiation," said NCEA Deputy Director Craig Baillie.

To evaluate energy use and costs, data obtained from each participating cotton gin included gin capacity, monthly energy use, energy costs, and production data for the previous 24 consecutive months.

To supplement this, a full list of electricity-consuming equipment was developed by classifying all electric motors according to major ginning process namely cleaning, ginning, packaging and handling to identify the distribution of energy consumption

The pattern of energy usage was analysed in relation to productive throughput and cotton quality parameters. It is found that overall, electricity and gas usage comprises about 61 percent and 39 percent (GJ/bale) respectively of total energy use (Figure 1) equating to a cost of about 77 percent and 23 percent respectively of overall energy cost (Figure 2).



Average Energy Use Profile

Figure 2 Average Energy Cost Profile



Researcher and USQ postgrad student Siti Amni, Ben Keft (Qld Cotton Wee Waa gin plant superintendent), Brian Madden (QLD Cotton regional electrician) and Dr Guangnan Chen, NCEA.

#### **Electricity**

Electricity usage (kWh) ranged around 46–58kWh per bale, while the electricity cost per bale was found to range from \$5.12–\$11.94/bale (Table 1). Cleaning and handling processes were found to have a higher electricity use than other processes and used some 70 percent of the total electricity required (Table 2).

Gin	Capacity (bales/hour)	Electricity (kWh/bale)	Energy Use (GJ/bale)	Electricity (\$/bale)
Gin A	40	48.80	0.176	5.22
Gin B	54	47.80	0.172	4.60
Gin C	60	52.28	0.183	11.94
Gin D	30	58.00	0.209	6.96
Gin E	24	46.50	0.167	5.12
Gin F	40	58.55	0.211	7.47

Table I Electricity Use and Costs

Gin	Cleaning	Ginning	Packaging	Handling
Gin A	34%	14%	12%	39%
Gin B	38%	15%	10%	37%
Gin C	32%	13%	13%	41%
Gin D	41%	15%	9%	35%
Gin E	32%	13%	15%	40%
Gin F	35%	14%	22%	28%

Table 2 Percentage of Maximum Energy Demand

#### Ga

Gas is consumed for the drying of cotton within in the gin. It is found that for normal harvest seasons, the drying process uses about 0.74–3.90m³/bale of natural gas and 2.27–5.61litres/bale of LP gas (Table 3). On average, drying uses about 0.1GJ/bale of energy which is less than half recorded overseas (Anthony and Eckley, 1994). The cost of gas in producing one bale ranged between \$0.98-\$3.39/bale. Generally the lowest cost occurred where natural gas was used.

		8			
	Capacity (bales/hour)	Natural Gas (m³/bale)	LPG (L/bale)	Energy Use (GJ/bale)	Gas cost (\$/bale)
Gin A	40		5.61	0.148	3.39
Gin B	54		4.31	0.114	2.65
Gin C	60	0.74		0.029	0.98
Gin D	30		3.85	0.102	2.33
Gin E	24	3.9		0.154	1.14
Gin F	40		2.27	0.06	1.3

Table 3 Gas Use and Cost

## **Future Work**

Detailed monitoring and analysis is ongoing at two of these gins to determine how, where and when electricity is used within the gin. The contributions of factors such as variable incoming cotton conditions (moisture, trash, and variety) and lint quality on energy consumption and production cost will be investigated. Detailed monitoring will also be used to determine the efficiency of individual machines or items of plant within key processes to inform future Cotton and grains: working to achieve greater efficiency and effectiveness in rural R&D through collaborative investment and effort.



# New collaborative projects link cotton and grain R&D investments

By Mary Ann Day

CRDC and Grains Research and Development Corporation (GRDC) have established a stronger working relationship at program management level to better focus on key areas where the two corporations could to work together even more effectively in the future.

CRDC's R&D investment management team and GRDC's Practices Program Management Team met in May and October to pursue a wide range of collaborative R&D investment opportunities. Not surprisingly, when the teams began investigating where crop production technology, farming systems research and human capacity initiatives between the two organizations coincided, a substantial list of opportunities emerged.

CRDC General Manager R&D Investment, Bruce Pyke, said the program management teams had discussed just under 40 opportunities in their recent meeting where improved collaboration was either under way or was flagged as possessing

strong opportunity for delivery of better outcomes to the stakeholders of both Corporations.

"Some of the key areas where opportunities exist for greater collaboration include grain/cotton farming systems, the National Invertebrate Pest Initiative (NIPI), the National Integrated Weed Management Initiative, Best Management Practices packages, sabbaticals for senior researchers, extension programs and sharing methodology on program evaluation and impact analysis," he said.

"Co-investment in joint publications and communications initiatives such as website co-ordination is now on the list and discussions during our October meeting agreed to pursue these in the immediate future. A number of joint publications were also scoped for implementation either in the current summer crop season, or in the period leading up to the next winter crop and beyond.

"We identified over 30 issues at the meeting that members of both GRDC



Collaboration in cotton and grains R&D is assured with the chairs of both corporations, Keith Perrett, Chair GRDC and Mike Logan, Chair CRDC ensuring support at all levels of both organisations.

and CRDC program teams have been progressing over recent months.

"Both teams gained a great deal from the meeting and plan at least twice yearly to manage the process that is now under way.

"Because we have been collaborating informally with GRDC for many years, a number of current and planned joint and collaborative investments are already in progress."

These include the National Program for Sustainable Irrigation (NPSI), Farm Health and Safety, Climate Change Research Strategy for Primary Industries (CCRSPI), greenhouse gas emissions research, monitoring Helicoverpa insecticide resistance monitoring, management of spray drift and glyphosate resistance in cotton/grain systems and participation in the glyphosate sustainability working group.

Mr Pyke revealed that there were also two new projects commencing in the 2009/10 financial year on Reducing Spray Drift and on Potassium, Phosphorous Nutrition R&D. In these areas there is strong ongoing collaborative involvement of both corporations which is reflected in the structure and management of these projects.

Bruce Pyke added that CRDC and GRDC have since met in Emerald and Brisbane with SRDC, BSES and QPI to discuss potential future investment in Central and Northern Queensland cotton/grains and cotton/grains/sugar farming systems research.

The GRDC national panel management group and senior management executives visited Narrabri recently and included a debriefing and issues exchange meeting at the CRDC head office.

Organisation heads Peter Reading, GRDC, and Bruce Finney, CRDC, briefed senior management from both organisations at the meeting and reiterated the importance of delivering greater efficiency and effectiveness in rural R&D through shared knowledge and joint investment among rural R&D corporations.







Copyright © CRDC 2007: This work is copyright protected. Apart from any use permitted under the Copyright Act 1968, no part may be reproduced by any process without the written permission of the Communication Manager, Cotton Research and Development Corporation. Disclaimer and Warnings: CRDC accepts no responsibility for the accuracy or completeness of any material contained in this publication. Additionally, CRDC disclaims all liability to any person in respect of anything, and of the consequences of anything, done or omitted to be done by any such person in reliance, whether wholly or partly, on any information contained in this publication. Material included in this publication is made available on the understanding that the CRDC is not providing professional advice. If you intend to rely on information provided in this publication, you should rely on your own appropriate professional advice. CRDC, the Cotton Catchment Communities Cooperative Research Centre (or its participants) and the topic authors (or their organisations) accept no responsibility or liability for any loss or damage caused by reliance on the information, management approaches or recommendations in this publication. Trademarks acknowledgement: Where trade names or products and equipment are used, no endorsement is intended nor is criticism of products not mentioned. Subscriptions: Spotlight is mailed to cotton producers, people in cotton industry organisations, research agencies and stakeholder organisations. If you want to subscribe, or unsubscribe, please either email or mail your advice to Spotlight.