Cotton Research & Development Corporation

Spotlight on Cotton R&D

Autumn 2010

Cotton meets wool

At the forefront of new fabrics

Australian Government
Cotton Research and Development Corporation

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Spotlight on Cotton R&D

Bruce Finney Executive Director, CRDC

As the industry commences harvest it's timely that we report on the ground-breaking work being undertaken to improve quality and capture higher value markets through CRDC's Value Chain Program, led by Dallas Gibb. CRDC is working closely with the Australian Cotton Shippers Association, Cotton Australia, CSD and the CSIRO in this endeavor. The opportunities arising are both exciting and challenging. Imagine consumers readily recognising an Australian cotton brand with a reputation of similar standing to Egyptian cotton. That's probably about as hard as imagining yields over 4.0 bales per acre fifteen years ago!

Through the Premium Cotton Initiative and collaboration with Australian Wool Innovation the industry is gaining new insights as to the competitive advantages of Australian cotton and the needs of our customers - the spinning mills, garment makers and brand owners.

This has included visiting overseas spinning mills to conduct surveys, run spinning trials with elite Australian cotton and engage with brand owners and spinners to assess their requirements and interest in developing new textile products from Australian cotton. This work has now progressed to collaboration in pilot projects with major international textile manufacturers and domestic brand owners in Australia to produce 100% Australian cotton and cotton/wool blended garments.

Further the market intelligence is that opportunities for long and extra long staple cotton varieties are appearing. Promisingly the CSIRO plant breeders are closing the yield gap with new premium varieties, while ACSA, CRDC and CA work toward securing premiums for growers from these varieties in the future.

Separately a series of industry forums has been enabling improved communication between all sectors of the industry's value chain in an effort to ensure the integrity of Australian cotton is maintained right through the process to garment manufacture. The last of these forums resulted in an initiative to establish a Warehousing and Dispatch Best Management Practices (BMP). The industry will then be positioned to achieve BMP from the farm to delivery to the mill.

We hope that the latest research articles on how to ensure fibre quality, reduce neps and short fibre content are of strong interest to you as you prepare for harvest and ginning.

Also in this issue, Sharon Downes and Rod Mahon report on the latest findings for Helicoverpa resistance levels in Bollgard II. This is a must-read for all growers and consultants as it highlights the ongoing need for grower and Monsanto's support of the Industry Resistance Management Strategy.

The cotton industry recognises that its future and the future of rural communities will largely be determined by the capacity of its people. It is for this reason that CRDC's strategically invests in researcher, industry and community capacity. At the same time it is understood that rural populations are declining with the notable exception of a growing aboriginal population. So investing in the capacity of aboriginal people simply makes sense. We report on outcomes of piloting a school based traineeship program for local indigenous students enrolled in Years 11 and 12 three traineeships.

In the next edition of Spotlight we look forward to reporting on the results of the industry's efforts to develop a vision of how the industry might look in 20 years time (2029) having overcome the significant challenges of the present.

in the spotlight ...

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.

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VALUE CHAIN

Premium Cotton Initiative Chair Pete Johnson, Fletcher Jones' Paul Shannon and CRDC's Dallas Gibb with (at front) Narrabri grower James Kahl, Esquel's Tian Ye and Phill Ryan on their recent tour to Narrabri

Cotton and wool pool research strengths

By Tristan Viscarra Rossel

CRDC and Australian Wool Innovation (AWI) are collaborating to make the most of the natural advantages of both wool and cotton.

The opportunity for immediate R&D collaboration to create new alliances in natural fabrics is now well-recognised having being highlighted in 2009 during the UN Year of Natural Fibres (INYF).

Both fibres on their own posses internationally-marketable characteristics and appear poised to capitalise on the increasing global demand for naturally produced textiles whilst the industries supporting the work are coming together for the greatest net effect for both.

INYF promoted natural fibres as a healthy, responsible and sustainable, while also being the high-tech and fashionable choice over man-made fibres like acrylic, nylon, polyester and polypropylene.

CRDC Executive Director, Bruce Finney, is enthusiastic about the moves afoot with joint R&D effort between cotton and wool R&D in Australia.

"It's a really exciting time for the cotton industry. Our circumstances have changed. We want to transform the value of Australian cotton and to do this, we need to work outside our usual marketing parameters," he said.

"AWI has a substantive history of investment in product development and market intelligence, making it an ideal research partner."

First off the blocks are a number of product development projects that will test the water of the new research partnership.

One of the world's leading premium cotton shirt producers, Hong Kong based Esquel, has already produced samples of one new product, a wool-cotton thermal shirt for cold climates.

"Esquel showed the garments to some retailers from the US, Europe and Japan, and they were very interested. They were used to buying 100 percent cotton, and the 20 percent wool gave the garment more resilience."

Esquel aims to have sample stock of the wool–cotton mix garment ready for buyers to inspect in July–September 2010, for northern hemisphere orders the following autumn.

Jimmy Jackson, General Manager–Product Development and Commercialisation at AWI, agreed that combining textile innovation provided great synergies, especially in the development of year-round garments as wool and cotton complemented each other.

"Together they are natural partners and produce a truly versatile product for all seasons and all occasions, extra lightweight garments with strength and wear performance."

Another new partner to the collaborative research initiative is about to commence trials to also develop wool–cotton mix yarns. If successful, it plans to launch the yarn in July 2010 at Spin Expo, an international trade show held in New York.

"People right around the world are concerned about their carbon footprint and other environmental issues, both wool and cotton have a great opportunity to ride on this macro trend," Jimmy added.

Bruce Finney said that Australian cotton grown under the Best Management Practice (BMP) program and Australian wool grown under the Verification of Australian Merino (VAM) program also offered consumers quality assurance to support the natural fibre story.

R&D program managers at AWI and the CRDC are also exploring options to pool research efforts to identify and reduce greenhouse gas emissions from the cotton and wool textile value chains, through a life-cycle assessment framework. Building on similar CRDC-funded research, this work could help both industries to develop technologies that reduce the greenhouse gas impact of laundering and drying textiles. (See the Spotlight magazine report Spring 2009 on Australian cotton's greenhouse emissions through life-cycle analysis.)

Bruce said that future collaboration could extend to market intelligence, joint research with international spinning mills and the development of systems for product traceability from paddock to garment.

Fletcher Jones supports Australian-grown fibre

One of Australia's largest locally owned apparel companies, Fletcher Jones, supports the Australian natural fibre story.

In repositioning its brand, the company is developing a new range of garments using Australian-grown fibre where possible. CRDC and AWI have been working closely with Fletcher Jones to source the best quality Australian cotton and wool for its new yarns and fabrics.

Paul Shannon, Merchandise and Marketing Manager for Fletcher Jones, explained that the company was taking a direction towards natural fibre luxury fabrics, and that part of its mantra was to support Australian agriculture.

"We can source the best raw materials in the world right here from Australian growers and we're looking at refining those raw materials into the best quality garments available."

By offering garments at a similar price point to non-Australian fibre products, Fletcher Jones hopes that consumers will make a decision to support Australian grown.

"There's no reason why they shouldn't because we know our raw materials are the best in the world," Paul said.

"We are working with Esquel in China who are undoubtedly the best spinners in the world. We now have the ability to produce a world class garment with all Australian fibre."

Paul recently visited both growers and ginning facilities in Narrabri, with Tian Ye, Esquel's Managing Director Specialty Spinning Division which was a great first-hand experience of Australian cotton. (See page 5).

"On the research side, we saw that Australian cotton is a world leader that is linked to the BMP program. From an environmental sustainability angle, it's a great story that the Fletcher Jones brand wants to tell," he said.

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VALUE CHAIN

Dr Bin-gang Xu, Rene van der Sluijs, Dallas Gibb and Director of the Institute Prof Xiao-ming Tao at a recent visit to The Hong Kong Polytechnic University where discussions occurred regarding novel Nu Torque spinning technology which produces ring spun yarns with a low twist and lighter weight fabrics that offer a soft handle with improved surface appearance, lower residual torque and reduced hairiness.

Field to fashion link to premiums

Australian cotton is viewed world wide as a quality fibre and as such is purchased at a premium for producing high quality fine count, combed ring spun yarns.

However, the Australian cotton industry faces increased competition in the premium market from cotton produced in the US, China, Brazil and West Africa.

As global economies recover consumer demand higher quality garments is expected to increase. Mills surveys in 2007 showed that the demand for ELS (extra long staple) cottons will increase substantially over the next five years to 10 years.

"The development of new long stable (LS) premium Upland cotton varieties by CSIRO Plant Industry provides the opportunity to develop higher premiums paid for fine long and strong staple fibre," said CRDC Value Chain Investment Manager Dallas Gibb.

"Development of low twist yarns with Australian LS will help position use of such cotton within premium mills that adopt low twist technologies."

Industry's strategic goal for Value Chain investments is articulated in the CRDC 2008-13 Strategic R&D Plan: "Add value to the Australian cotton industry with premium products in improved routes to market".

While most of industry's R&D investments before 2008 were to support and directly invest in plant varieties on-farm productivity, it is now proven that if the industry wants to add further value to its cotton beyond the farm gate, new partnerships need to be established consumers of cotton right through to the brand owners.

Fibre quality provides the basis for the industry's competitive advantage, and "developing information packages, technologies and marketing strategies to leverage the advantage that our premium fibre quality can offer to a spinner or brand owners, will play an important role in securing the industry future" said Dallas Gibb CRDC Program Manager for Value Chain Investments.

"Facilitating new engagement mechanisms with industry and end-users to enable a common understanding of the competitive advantages of Australian cotton products is imperative to the success of the industry," Dallas said.

CRDC is working with the Australian Cotton Shippers Association (ACSA) and Cotton Australia to develop strategies for developing new market opportunities for Australian cotton. Developing alternative pathways for exploiting the competitive advantage of current premium products is a priority.

In developing future priorities for R&D investment, CRDC is conducting surveys of mill customers and brand owners as well as assessing technology developments across the spinning and fibre sectors.

For the spinning mill, their prime competitive advantage is in the quality in yarn and fabrics. With the development of long staple Upland cotton by CSIRO breeders, the opportunity exists to produce finer yarns (in the 80-100Ne count range) for the production of high quality premium garments.

In considering advances in spinning technology, during a recent visit to The Hong Kong Polytechnic University by Dallas Gibb and Rene Van Der Sluijs from CSIRO discussions occurred regarding novel Nu Torque spinning technology developed at the University in 2002. The technology can offer spinners the capacity to produce cotton ring spun yarns with a low twist (25-45 percent lower) and lighter weight fabrics that offer a soft handle with improved surface appearance, lower residual torque and reduced hairiness.

"With unique wool-like softness of fabric made from Nu-Torque cotton yarns, this technology will help cotton to be better able to compete with premium fibres such as cashmere and other man-made fibres in the areas of shirts, polo shirts, pants and sweaters," says Prof Xiaoming Tao, leading researcher for the technology and Chair Professor and Head of Institute of Textiles and Clothing at the university.

Prof Tao said the current technology has been successful in commercial production of cotton yarns that are 70 to 60 Ne, and their products have been sold worldwide since 2006 including knitted and woven garments including sweaters, shirts, polo shirts and pants.

The Polytechnic researchers are progressing in refining the spinning techniques to produce > 60 Ne yarns for the woven fabric market.

"We know that the commercial production of these new premium quality varieties by growers is dependent on demand from mills," Dallas Gibb says.

"To optimise the value of the new premium fibres the opportunity exists to use improved spinning technologies such as Nu-Torque to develop new premium yarns and garments."

According to Prof Tao, significant premiums are gained by mills using low twist technologies.

CRDC are investigating the opportunity for a collaboration project to be developed between Deakin University, CSIRO Materials Science and Engineering and Hong Kong Polytechnic University to assess the relationship between fibre quality, yarn and fabric quality using a low-twist yarn spinning technology developed at Hong Kong Polytechnic University.

In developing any project it is hoped that different fibres blends such as cotton/wool and Pima/Upland cotton blends as well as the use of 100 percent premium Australian cotton can be assessed.

New software technology under development

Over the last two years, the Cotton CRC invested in partnership with CSIRO to develop new software systems for spinning. When completed, the Cottonspec software is designed to assess how to improve spinning efficiency based on changes in the quality of fibre used by the mills.

The project is also examining the value of specific measurements of fibre fineness and maturity on the ability to predict yarn and fabric quality.

If successful the new software technology will allow spinners to better understand how these measurements may be used to improve bale selection within a laydown to optimize production of premium yarns, including Pima and premium upland blends.

Currently CSIRO researchers Drs Shouren Yang and Stuart Gordon are working with a number of mills in China to evaluate the value of the technology. Once the system is refined the aim will be to do more extensive commercial mill assessment in 2010.

The promise of premium fibres, industry support and field to fashion links are proving a key mix for the new players.

Wee Waa cotton grower James Kahl explains the growth habbit of Australian varieties to Esquel's Tian Ye and Fletcher Jones' Paul Shannon on Mr Ye's recent visit to Australia.

Garment maker and brand owner tour cotton country

As part of the Premium Cotton Initiative, Tian Ye, Managing Director of Esquel's Specialty Spinning Division and Fletcher Jones' General Manager of Merchandise and Marketing, Paul Shannon, visited Narrabri in February in an intensive round of meetings with researchers, industry leaders and farmers.

The visit is poised to be pivotal in inching the cotton industry one step closer to a unique collaborative opportunity that links growers, merchants, mills and brand owners under a common goal to promote 100 percent Australian natural fibres. The promise of premium fibres, industry support and field to fashion links are proving a key mix for the new players.

Esquel Limited is a large family owned textile and garment manufacturing company based in Hong Kong. It is a fully integrated company that grows its own Pima cotton in China and processes its cotton to produce some of the highest quality shirting garments in the world. The company is a leading supplier to brand names such as Nike, Polo Ralph Lauren and Hugo Boss.

Dallas Gibb, CRDC Value Chain Program Manager first meet with Tian Ye in China in 2008 to explore opportunities for collaboration. In November 2009, a joint delegation of the CRDC and ACSA and Australia Wool Innovation travelled to Esquel's speciality spinning mills in Guangdong. Paul Shannon from Fletcher Jones also took part in the trip with the aim to develop links with the company for supply of quality fabrics.

Dallas said the trip was very successful, "establishing what we hope will be a long term partnership between the two leading natural fibre industries in Australian, Esquel and Fletcher Jones."

Leading from the visit to China, both Tian and Paul where keen to see the Australian industry first hand.

The visit to the cotton industry started with a meeting at AWI Office in Sydney, which included cotton industry representatives of Dallas Gibb, Cotton Australia CEO Adam Kay, ACSA Chair Arthur Spellson and past ACSA chair Phill Ryan.

AWI was represented by Global Product Development Manager (Knitwear) Roy Kettlewell, and CEO Brenda McGahan.

This meeting gave the opportunity to make presentations on the cotton industry's BMP program, Premium Cotton Initiative and AWI related programs. However, the key agenda item for the meeting was to continue with discussion initiated in China regarding the development of a new 100 percent Australian cotton/wool thermal garment.

A visit to Narrabri also ensured an up-close look at the cotton industry, from breeding to farming and ginning.

Phill Ryan, Paul Shannon, Dallas Gibb, Tian Ye met with CRDC Executive Director Bruce Finney, General Manager R&D Investments Bruce Pyke and Premium Cotton Initiative Chair Pete Johnson.

"It gave us the chance to espouse the sustainability issue of cotton growing, demonstrated through the recent Life Cycle Analysis study of a cotton t-shirt – which showed it to be more environmentally friendly to produce than polyester," Bruce Finney said.

A visit to the Australian Cotton Research Institute gave the visitors insight into where our new premium breeds of cotton emerge, and the facilities and capacity of Australia to meet premium markets.

Paul and Tian also met with the CSIRO Cotton Breeding Program headed by the CSIRO Cotton Breeding Team of Dr Greg Constable, Dr Shiming Liu and Dr Warwick Stiller.

Discussing the ongoing development of premium varieties was of key importance, Dallas Gibb says.

"This shows the competitive advantage that the industry can offer companies such as Esquel over the long term through the supply of premium quality cotton.

Both Tian and Paul where very keen to see cotton production in action and talk to local growers.

They visited three local farmers, James Kahl, Andrew Greste and Richard Cathcart. Through the discussions with the growers they gained an appreciation of cotton production systems and the efficiency of Australian farming practices.

Paul Shannon indicated that Fletcher Jones was interested in marketing the natural fibre story and understanding how cotton and wool production systems operate, asking the growers how implementing BMP changed and improved their farming systems.

Next stop was a tour of Namoi Cotton operations in Wee Waa. Marking Manager David Lindsay showed Tian and Paul through the classing rooms, gin and warehousing facilities to complete the value chain tour from seed to bale, while a tour of Australia's most modern gin at Auscott rounded off the visit.

VALUE CHAIN

Inspecting the appearance of yarn spun from Sicala 350B are Production Manager Hong Zhuan Du, Quality Manager Paul Ke, Assistant Quality Manager Heng Chan Lin of Dai Chung Textiles Ltd with CMSE Textile Technologist Rene van der Sluijs.

Premium Cotton – Mill results positive

Following on from last year's (2009) successful commercial mill trials in India designed to highlight superior fibre properties of Australia's new Long Staple (LS) Upland variety Sicala 350B, a further trial in China again found that the variety can be successfully spun into high quality medium to fine count yarns in both 100 percent, and 70/30 Pima/Sicala 350B blends.

Sicala 350B variety was developed for industry by CSIRO Plant Industry. The first commercial trial was in India conducted at Vardhman Textiles Limited in March 2009.

These trials found that 100 percent Sicala 350B can be successfully spun into high quality fine count Ne 50-70 combed, normal ring and compact spun yarns that performed well in high speed weaving, producing high quality fine shirting material.

According to CSIRO Material Science and Engineering's René van der Sluijs who oversaw the trials, although this information was well received the question remained whether these results could be replicated across the industry.

With cotton growers producing 465 bales of Sicala 350B for processing trials during the 2008/09 season the Premium Cotton Initiative actively sought to conduct more commercial trials with ACSA nominated mills to further demonstrate the concept.

Central Textiles Limited (CTL) with its head office situated in Hong Kong has two spinning mills located in Zhanjiang in the Guang Dong Province of the Peoples Republic of China. CTL has a long association with Australian cotton. It produces yarns in a large range of staple fibres with cotton used in over 90 percent of their production as 100 percent, in addition to blends.

The commercial trials were conducted at Dai Chung Textiles Limited (DCT) during November 2009.

Two different lots of cotton were examined in this study:

- Lot One 100 percent Sicala 350B
- Lot Two 30 percent Sicala 350B/70 percent Pima

An added bonus for this study is that CTL have normal ring, compact and Nu-Torque™ (low twist) spinning systems which allowed for a thorough assessment of the capabilities of Sicala 350B. The yarns produced were combed 40Ne, 50Ne and 60Ne spun hosiery yarns.

The results confirm that, with some attention to detail, Sicala 350B can readily be spun into high quality medium to fine count yarns. This applies to both 100 percent, and 70/30 Pima/Sicala 350B blends.

While strength was not an issue (as it averaged 32 cN/tex), the DCT trial raised issues that need to be considered. These are:

- MICRONAIRE: The Micronaire values must be below 4.5 for fine count yarns (40 Ne and finer), to ensure that the number of fibres in the cross section is sufficient to produce yarns with the required evenness and imperfections (thin, thick, neps).
- MATURITY: The fibre needs to be mature as high quality knitwear is produced from these yarns, which require good appearance and dye ability.
- NEP: The nep content must be < 200 neps/gram and short fibre content (% SFC (w)) below eight percent.

What's the Premium Cotton Initiative?

The study of the commercial mill trials is part of the Premium Cotton Initiative (PCI).

PCI is a collaboration between Australian Cotton Shippers Association, Cotton Australia, CSIRO, Cotton Seed Distributors and CRDC (who provide co-ordination for the initiative).

The PCI was formed to identify and create markets for long-staple (LS) Upland variety types developed by CSIRO Plant Industry.

Partners of the collaboration are focused on better understanding textile performance and developing predictive textile performance technologies tailored to high quality Australian raw cotton fibre.

Being casual is serious business

A recent ACSA/CRDC survey of mills sees a trend toward more casual wear – which achieved the highest growth ranking of all textile sectors.

Surveys from international mills and domestic brand owners conducted by the CRDC in collaboration with Australian Cotton Shippers Association have highlighted the shift in use of cotton within the apparel market – and casual is in.

A preliminary report of the surveys, completed by consultant Pete Johnson, CRDC's Dallas Gibb and CSIRO's René van der Sluijs, has found that the high end business shirt market has been replaced by consumers' demand to dress down and be smart but casual.

"The message derived was clear, particularly with regards the 'casualisation' of the overall apparel sector," report co-author Pete Johnson said.

"Formal and business apparel achieved the lowest growth ranking of all sectors – apparently a casualty of the trend toward more casual wear – which achieved the highest growth ranking.

"Casual attire clearly shows the strongest overall growth, and also the strongest growth in terms of cotton's share of the segment."

Pete said whilst acknowledging it is not an exact science, the report combines mills' and brand owners' data to create an approximate Cotton Usage Growth "Index" to help identify the most suitable sectors on which to focus downstream marketing efforts.

"Unsurprisingly then, Figure 1 clearly identifies 'casual attire' as the sector with most potential for growth, with 'street attire' and 'home textiles' also areas of moderate potential.

"The most surprising outcome was the significant fall in demand for formal business wear. Also a surprise was the poor performance of inner attire."

According to CRDC Value Chain Investment Manager Dallas Gibb, the results show an obvious shift in generational fashion.

"As Australia is a producer of high quality cotton, it has traditionally been targeted at the high-end business and formal wear market," he said.

"The casual apparel market was seen as a market for lower quality cotton types and not Australian cotton.

"Clearly this is longer the case and it is time to change our focus in understanding how best we should position our cotton.

"Of course being casual or having good street attire in the draw at home, no longer means that such clothing is made from poor quality cotton."

CRDC will consider this information to better position its R&D investments in the value chain.

"Casual attire will have a different feel and finish to business shirts etc and we need to see how Australian cotton can be best used in these growth markets," Dallas said.

This shift in focus will be an interesting challenge for the Australian cotton industry.

"We will need to emphasise the natural functions of cotton such as absorbency, softness and bulkiness more as cotton products with functionality/nanotech are currently far too expensive, blends may also be a option," René van der Sluijs says.

"Yarn counts may also need to drop to 60-70Ne and low twist yarns are becoming more popular," he concluded.

Figure 2. Cotton Usage Growth Index

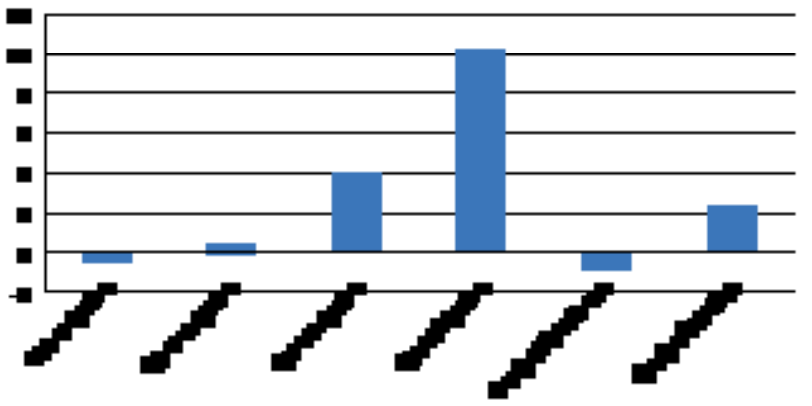
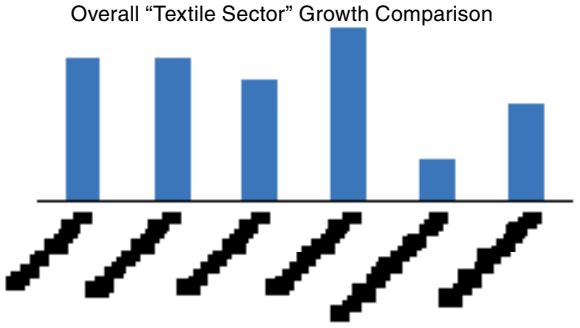
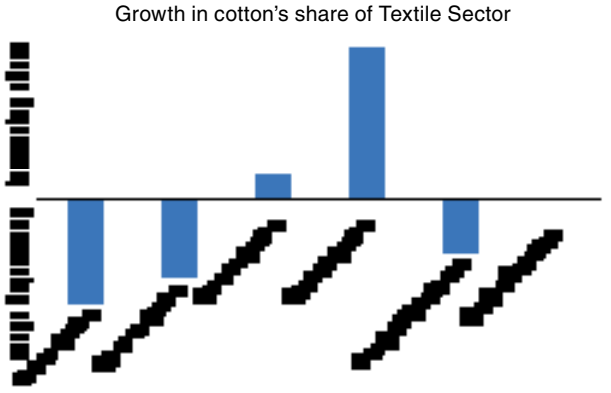


Figure 1 – Growth Comparisons within the Broader Textile Market

Overall "Textile Sector" Growth Comparison



Growth in cotton's share of Textile Sector



VALUE CHAIN

Neps now number one quality issue

High nep content is an issue for Australian cotton which is usually purchased for the production of high quality, fine count yarns.

Melanie Jenson and
Rene van der Sluijs

A survey titled *Quality Issues for Australian Cotton from a Mill Perspective*, conducted in 2003/04, highlighted that the nep content in Australian cotton was considered too high and would not meet the requirements of international high quality fine count spinners.

The survey showed the average nep content of Australian cotton was 276 neps/gram, above the preferred nep content in lint which is below 250/gram (equal to the 50 percentile line of the Uster Statistics).

This is an issue for Australian cotton which is usually purchased for the production of high quality, fine count yarns. Neps adversely affect the appearance of cotton yarns and fabric and are usually associated with lower yarn strength, ends down in spinning and a less uniform yarn.

The appearance of dyed or printed fabrics is negatively influenced by the presence of neps, as neps, which often comprise immature or 'dead' fibres, absorb dye and reflect light differently and appear as spots or 'flecks' on finished fabrics.

"We needed to benchmark the type and level of neps in Australian cotton to other growths, and assist the industry in implementing measures to reduce/control the nep content in Australian cotton," says CSIRO Materials Science and Engineering Textile Technologist René van der Sluijs.

"This testing would also assist and feed into other projects focusing on ginning research, instrumentation work, Best Management Practice (BMP) for ginning and linking farm systems to fibre quality."

In response to this need, CMSE purchased a Uster Technologies Incorporated AFIS PRO instrument, and with funding from CRDC and support from the Australian Cotton Classers Association and Australian Cotton Shippers Association, the nep content of the Australian cotton will for the first time, over three seasons (2007,08,09) be accurately and objectively determined by an independent organisation.

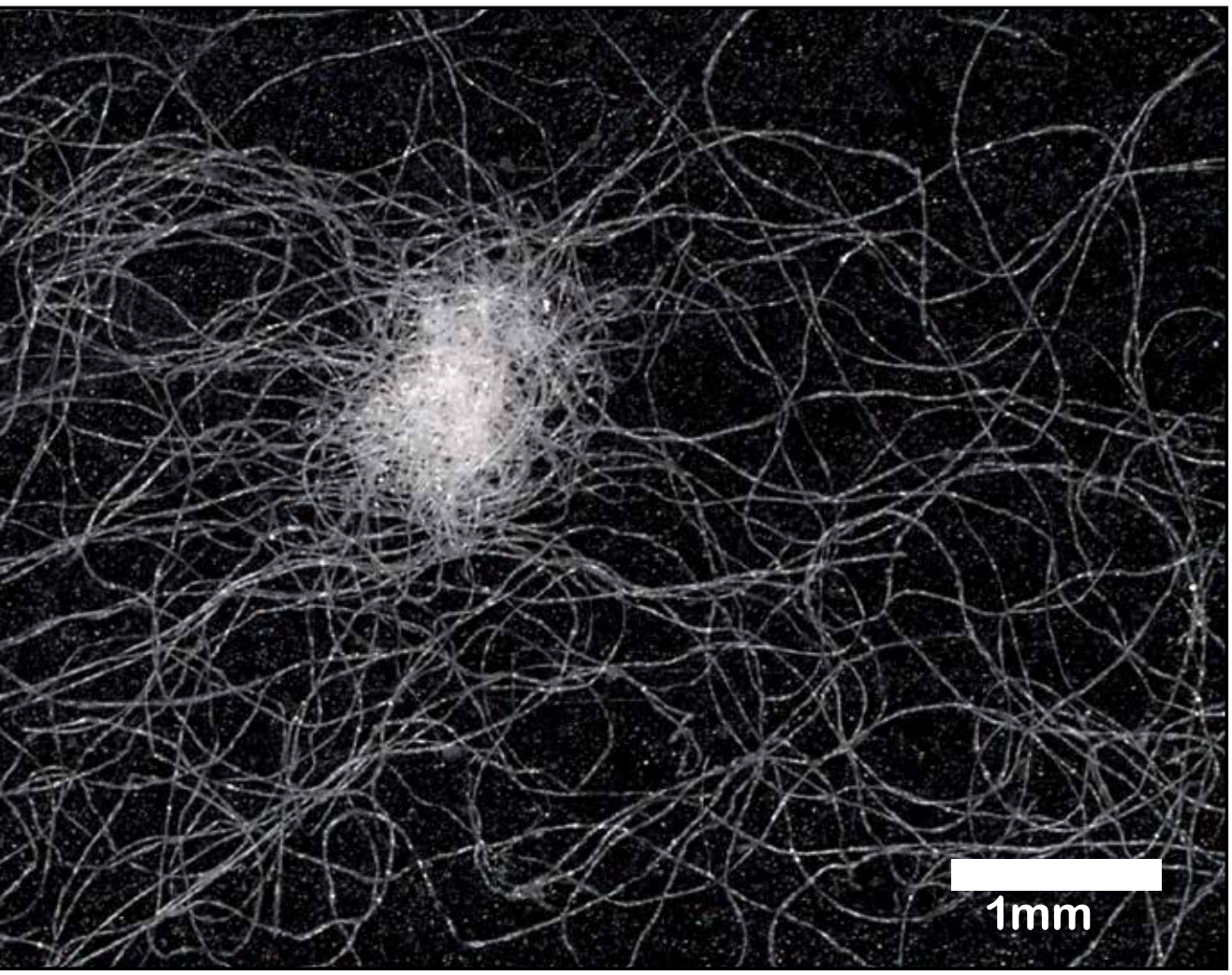
The first results for the 2007 crop were in line with the initial 2003/04 mill survey - showing that the average nep content was slightly above the desired level, at 270neps/gram.

Then in 2008 a total of 982 samples from 32 varieties, nine growing locations and ginned at 23 gins were collected by classing facilities and forwarded together with their bale number, High Volume Instrument (HVI) data and further information such as the growing area, variety and gin, to René van der Sluijs at CMSE's Cotton Testing Laboratory in Geelong.

The results for the 2008 crop were recently released and showed that while seed coat nep and short fibre content values were average and acceptable in both 2007 and 08, the nep value was higher at 355 neps/gram, or 105 neps/gram above the desired level. It was also 85 neps/gram above the average for the 2007 crop.

"This is not unexpected considering that the 2008 crop season was one of the mildest seasons in the last 50 years, resulting in a lower and more veritable Micronaire," René said.

"As was the case in 2007, there were large variations in nep, seed coat nep and short fibre content,



which needs to be investigated further once all the samples for the three years (2007-08-09) have been tested and analysed."

Samples were also tested for fibre fineness using Cottonscan. The fineness values from this instrument and the Micronaire values from the HVI instrument are used to calculate maturity.

The 2008 crop had an average fineness of 191 mtex, which can still be considered to be fairly coarse for premium fibres although it is slightly finer than the 2007 crop, which had an average fineness of 204 mtex.

"The average maturity was 0.78, which is less mature than the 2007 crop which had an average maturity of 0.85.

"As was the case in 2007, there are also large variations in the fineness and maturity values that need to be investigated further," René said.

Once information has been gathered for the 2009 crop year a more comprehensive analysis of results will be conducted, which will attempt to measure the broad interactions between variety, location and gin on nep content in Australian cotton.

As the Australian industry looks toward developing new premium fibre classifications for selective markets, the baseline data developed from this work will prove invaluable in demonstrating the key areas where our fibre quality can be improved and that Australian cotton can maintain it reputation for quality with its key customers.

What is a nep?

A nep can be defined as a small knot (or cluster) of entangled fibres consisting either entirely of fibres or consisting of foreign matter entangled with fibres.

The formation of neps is dependent on cotton lint characteristics (e.g. long, fine and/or immature), as well as on the mechanical handling (manipulation) of the fibre from the field to the yarn.

It is commonly accepted that neps fall into two basic groups:

1) Biological/Raw - Containing foreign materials, such as seed, leaf and grit, with fibres attached. In unginned cotton, biological neps are typically associated with malformed seed, unfertilized ovules and dead seed. These are sometimes referred to as seed coat neps.

2) Process/Mechanical - Composed of fibres and has its origin in the manipulation of the fibres during processing.

Managing for Neps

A range of factors can contribute to the level of neps developed across each processing stage for cotton.

CRDC and the Cotton CRC have supported CSIRO CMSE and Plant Industry in assessing impacts on neps and ginners are well aware that ginning and lint cleaning can influence nep levels. The aim of R&D programs in this area is to assess how simple changes in crop management and ginning techniques can be made to reduce the risk of developing high levels of neps.

At a production level, growers need to be aware that neps are not just about ginning and something that happen in the spinning mill. The quality of the fibre produced, particularly fibre maturity and strength can have a major effect on nep generation. Crop management, timing of defoliation and presentation of the cotton, e.g. trash and moisture content, to the gin can have a significant impact of how the cotton is ginned and therefore final nep levels.

VALUE CHAIN

Early defoliation impacts

By Tristan Viscarra Rossel

"... spinning clients are starting to voice their concerns about neps"

A leading researcher at the forefront of advising how on-farm decisions impact cotton quality, Mike Bange, says that when preparing the cotton crop for harvest, the manager's decisions can have significant impacts on the quality of the final yarns and textiles.

Ineffective application of defoliant, or applying a defoliant too early, can affect cotton fibre quality in a number of ways, Mike says.

He said it can increase the amount of trash in the seed cotton. During ginning, additional lint cleaning passes will be required to remove the trash, and with each pass, the nep count of the final fibre increases.

"Another is that the proportion of immature fibre in the harvested cotton will potentially increase if a defoliant is applied before 60 percent bolls open. Immature fibres are more prone to nep formation during harvest and ginning which has consequences for the number of lint passes in ginning and subsequent neps.

"The more lint cleaning passages, the more chances of increased neps. Too early defoliation can also have consequences in terms of neps because it influences the maturity of the cotton fibre; you're collecting more immature fibre if you go too early."

From the CSIRO research linking on-farm decisions with fabric quality, Mike is confident that that the best time for defoliation is around 60 percent bolls open, or four nodes above cracked boll (NACB). At this measure, it reduces the risk of neps created at harvest and in the gin. The risk of neps is increased when defoliating earlier especially if the end of has been cool which may mean that the crop inherently has more immature fibre.

Ginning issues

Wayne Towns, Auscott Limited, Narrabri, says that, "defoliating too early created problems for ginners in terms of the increased amount of trash".

"From a ginners point of view, foreign material is the most critical factor; it has the biggest influence on the grade of the cotton that we put out," he said.

"If the leaf hasn't dropped off the plant properly before it is picked, ginners have to try and get that out. Normally, the only way is with extra lint cleaning, which can double the amount of neps you put in the cotton. It also adds to the short fibre content and reduces the lint yield.

Producers needed to take care when preparing for harvest, especially after putting so much effort into their crops throughout the growing season."

Textile issues

CSIRO Materials Science and Engineering Technologist, René van der Sluijs, explained how neps formed during ginning.

"The fibres of immature cotton are not very strong; they bend and buckle easily," he said.

"When fibres are mechanically manipulated during ginning, the immature fibres form neps. In the ginning process, where there's a lot of mechanical handling of the fibres, a lot of neps will be formed, which is a problem in yarn production."

If the spinner makes a 'neppy' yarn that is converted into a fabric and dyed, the immature cotton neps don't take up as much (or no) dye as the rest of the fabric. In a high-value, premium cotton garment, this reduces its value.

"You will see white spots on the surface of the fabric," René said.

"Obviously, if you are buying an expensive pure cotton shirt that's supposed to be navy blue, you don't want a shirt full of white dots."

Australian grown cotton is one of the most efficiently produced crops in the world, but that efficiency comes at a price. The mechanical picking and saw ginning used in Australia introduces a higher incidence of short fibres and neps compared with countries that hand pick or roller gin. René believes it critical that our raw cotton is harvested in the best condition possible, and that management decisions on farm have a great impact on the extent of neps in the final product.

"The problem of neps has been flying underneath the radar but now, more and more marketers and spinning clients are starting to voice their concerns about neps," René said.

"It's something that's been with Australian cotton for

fibre quality

quite a long time because we are one of the most automated and mechanised cotton industries in the world. If there would be any neps around, it would be from us."

Marketing issues

Dealing with the outcomes of poorly timed defoliation decisions can create headaches for marketers further down the value chain.

Arthur Spellson Chairman of the Australian Cotton Shippers Association, explained some of the marketing issues.

"Through projects like the Premium Cotton Initiative with CRDC, we are trying to get Australian cotton used in better quality products, but nep count and short fibre index are two drawbacks to Australian cotton from a spinners perspective," he said.

"The amount of neps and short fibres as a result of our machine picking and our ginning is going to be determined in part by the condition of the cotton when it is picked and then ginned.

"If bolls have been opened prematurely – through defoliation practices or seasonal effects – then it will affect the amount of damage done during machine picking and ginning."

After speaking with many spinners, Arthur said one of their biggest concerns regarding the quality issues of Australian cotton was the waste it generated.

"Spinners have to card out the short fibres – they are too short to spin – and this adds to their raw material costs because some of the cotton we've delivered can't be used; it goes into their waste pile," he said.

"When they are trying to spin for these better quality garments, it becomes more important. They need to make a premium product and they blame us for cost blow outs when they have to get rid of the short fibres."

Arthur has become more aware of the neps issue when trying to get Australian cotton into a better quality garment.

"When you are making finer count yarn, neps are more likely to show up than if you're making something coarse count. That's when you are more aware; complaints increase."

Arthur said that nep and short fibre content were limiting the ability of marketers to generate substantial premiums for the longer and stronger cotton Australia is now producing.

"The researchers are doing a great job with new varieties, and we need to extract the quality benefits to stay ahead. This will enable us to maximise premiums for Australian cotton, and pass those premiums back to the grower."

Nep survey

Later this year, the industry will complete a major neps survey to quantify the average neps in Australian cotton and identify the main causes.

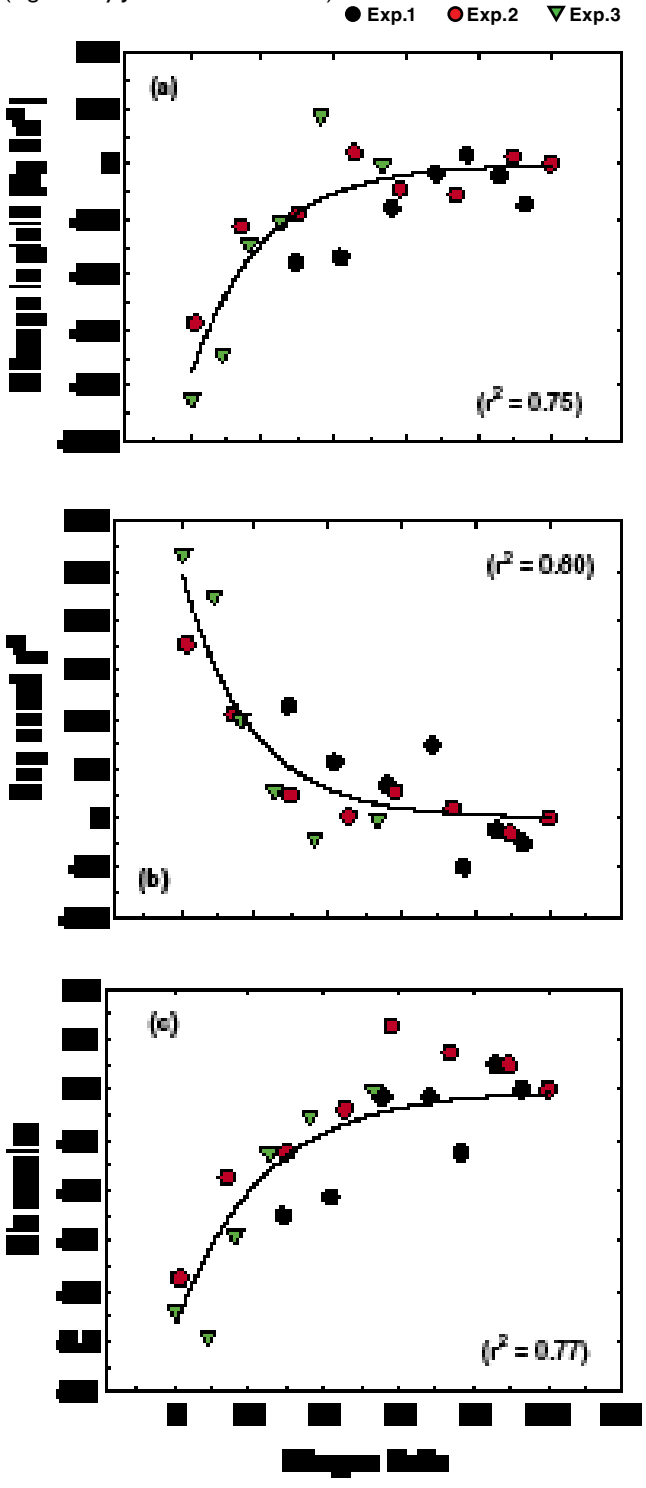
"We want to find out what is the average neps in Australian cotton, and then try and find out what's causing the neps," René said.

"Is it from a certain variety, a certain valley or a certain gin?"

The results of the survey will be used to develop measures that may help to reduce the nep content in Australian cotton.

"...nep and short fibre content were limiting the ability of marketers to generate substantial premiums for the longer and stronger cotton Australia is now producing"

Figure: Response of changes in (a) lint yield, (b) micronaire, and (c) neps with changes in the time of harvest aid application. The change is calculated from the difference between the earlier applications and the final harvest application. Nep levels are following one lint cleaning passage. Taken from Bange et al. (Agronomy Journal 102:781-789.)



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VALUE CHAIN

Field to Fabric: 10 down and a long way to run

F2F 2010

- secure your place!
- July 20-22 2010
  Belmont Vic.
- Rene van der Sluijs
  03 5246 4000

Key players in the industry's quest for new value in Australian cotton, Dallas Gibb, CRDC program manager, and CSIRO's Rene van der Sluijs.

Since its inception five years ago, the cotton industry's Field to Fabric (F2F) course has been presented nine times and transformed the understanding of 217 people about the uniqueness of cotton, Australia's world-leading production system and the opportunity for a sustainable future.

The F2F initiative was the brainchild of René van der Sluijs, Textile Technologist with CSIRO's Division of Materials, Science and Engineering (CMSE), and one of the industry's most knowledgeable people in his field. René, together with the industry's Training Manager, Mark Hickman, QDPI&F, and picking contractor / trainer Geoff Dunlop, with the help of Martin Prins, Mike Bange, Stuart Gordon and other representatives from industry, worked tirelessly to develop and run the course over the past five years.

The industry has seen the course change from a purpose-designed industry course to a widely-regarded general cotton and fibre course that now attracts a broad audience both domestically and internationally.

"The F2F course was developed to increase the understanding of cotton producers and industry personnel of spinners' requirements, which helps the Australian cotton industry to continue to deliver quality cotton," said Cotton CRC CEO Philip Armytage.

"The course is a pivotal part of the Cotton CRC education and training program that we hope continues well into the future."

In 2010 a module on cotton breeding and variety selection will form part of the course. To make way for the new material, the program is extended to three full days. Presented by Steve Ainsworth, CSD General Manager, the new inclusion reflects a growing interest as highlighted by previous course participants.

A cotton gin has been installed at CMSE which will assist in the presentation of the ginning module.

Initially, the course focused on the Australian industry, but in step with moving trends, has broadened to look at the industry world-wide then focus in on Australia.

This change has largely been driven by increasing attendance by university students studying fashion and textiles courses. At the two most recently held courses a total of 20 participants were students and studying fashion and design technology at RMIT in Melbourne.

According to René, the attendance of fashion technology students offers the cotton industry a golden opportunity to market itself to possible future users of its product. "These students will be designers of the future," he said.

"It is really interesting to see them interacting with growers, consultants and merchants at the course.

"The broadening cross-section of participants offers wonderful networking opportunities and for people like students to meet actual growers, ginners and the like may not come about otherwise.

"It has turned out to be a fantastic marketing opportunity for Australian cotton."

The course is also going international with help from Austrade, who had been working with René and others like Dallas Gibb and Pete Johnson in the Premium Cotton Initiative Mill Trials (see story page 6).

René said officers at various Austrade offices in South East Asia have offered to distribute future course details to the textile industry in their various areas.

To mark the 10th course, this year's participants will receive a 100 percent Australian grown and Australian manufactured cotton t-shirt. The shirts are the result of a bold venture of Ruth Armstrong, a cotton grower from the Darling Downs who took on the challenge to create a "true" 100 percent Australian cotton garment.

The cotton was grown on her property and spun at the CMSE mill in Geelong, knitted, dyed and made up in Melbourne.

New variety closes ELS yield gap

By Melanie Jenson

A new CSIRO breeding line is approaching premium fibre quality criteria, with minimal yield penalty for growers

CSIRO plant breeders are closing 'the gap' between yield and quality with new premium fibre varieties.

Australian cotton growers have been fortunate to have access to CSIRO mainstream varieties, which have improved fibre quality compared with previous varieties, but a change in demand from mills for premium, ELS type cottons has seen a slight change in breeding priorities.

"Development of premium fibre quality varieties has been a research target for CSIRO cotton breeders for some time, and recently it has become clear that the concept has some potential," says Dr Greg Constable, CSIRO Plant Industry Stream Leader.

"However premium fibre can often be associated with lower yield.

"Sicala 350B for example has a yield penalty of 15 to 20 percent compared to industry benchmarks such as Sicot 71B.

"A new CSIRO breeding line (CSX326BRF) is approaching premium fibre quality criteria, with minimal yield penalty for growers. The variety, already under seed increase with CSD, is a Bollgard II/RRFlex line, the most common trait combination.

"There are also many other options for premium fibre lines under development at CSIRO." Good news for industry is that lint from the CSX326BRF seed crops can potentially be used for spinning tests under the Premium Cotton Initiative to further assess the suitability of the fibre for high end markets and low twist yarns. This testing can occur with lint from the 2010 harvest this year. Preliminary smaller scale spinning tests are currently being done on CSX326BRF at CSIRO Materials Science and Engineering at Geelong.

"It has become clear from our own fibre data so far and what we know about the association between fibre properties and spinning performance, that the fibre from CSX326BRF is superior to that from Sicala 350B," Greg said.

"The target properties we have for a premium quality variety are: fibre length 1.25 inches; fibre strength 34 g/tex; intermediate micronaire with fibre maturity 0.85 or better and fineness 170 or less.

"We are close to achieving those fibre properties with CSX326BRF and since there should be little yield penalty, such a line could be a viable option commercially.

"If yield and fibre results from CSX326BRF in the 2009/10 season confirm existing results, it could be available commercially through CSD for the 2010 sowing season (potential variety name not determined as yet).

"Our ultimate aim is to have a premium fibre variety to set a new benchmark for yield and quality and CSX326BRF could be the next step towards that objective."

Cotton Seed Distributors (CSD) General Manager Steve Ainsworth says there is a continuing high level of interest in the industry about new varieties which continue to demonstrate improvements in yield and fibre quality.

Whilst yield and quality improvements are key economic drivers for growers, it is important to note that varieties with improved fibre quality (particularly fibre length) can also reduce production risks in tough seasons where limited water may be an issue or under dryland production conditions

"CSD's large scale replicated trial program is designed to assess candidate varieties under real world conditions and CSX326BRF is an important part of this year's program and also makes up a significant portion of this seasons seed increase program," Steve said.

"Our long standing partnership with the CSIRO cotton breeding team continues to deliver the Australian industry varieties from a very robust breeding pipeline.

"Cotton breeding is all about the commitment and focus of the team and it is well recognised that the CSIRO Cotton Breeding team is a world leader on this score with a track record of continued improvement in both yield and quality.

"The breadth of this achievement is very impressive especially when you consider the challenges presented by an ever evolving landscape with new biotechnologies and market needs."

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VALUE CHAIN

"The Australian cotton ginning industry has a great reputation which we must all work jointly to retain and develop." - Jeff Ballentine.

Increased communication improves product quality

By Melanie Jenson

Protecting the quality of our cotton doesn't stop until it is delivered to our mill customers and management of each bale developed at the gin to ensure it remains in optimum condition throughout the storage and handling period is vital.

This was the message driven home at December's Industry Value Chain forum, which resulted in an initiative to establish a Warehousing and Dispatch BMP to ensure the integrity of Australian cotton right through the production chain.

"The industry is striving to drive into new premium markets and the quality of our cotton and its presentation will help achieve this," says Pete Johnson, forum organiser and chair of the Premium Cotton Initiative.

"It is a highly competitive environment in which our cotton is marketed and the new Warehousing and Dispatch BMPs will help secure our competitive advantage."

The forum was the third in this series of Value Chain forums held last year, the result of a collaboration between ACSA and CRDC which brought together a wider, high level of the supply chain audience to challenge a number of assumptions the industry has made over potential market leverage points for our fibre.

Pete Johnson, said the recent event provided an opportunity for ginners, merchants, logistics and transport companies to discuss the critical issues that affect various points in the domestic supply chain.

"This opportunity helped improve communication over the impacts of various activities on downstream supply chain partners and has provided a framework from which a set of BMP guidelines can be established," he said.

"These will be tailored to provide pathways for improved storage and handling efficiencies while also providing quality assurance for our customers."

The BMPs are to be developed in partnership with ginners, transport, warehousing and shipping sectors will complete the cycle of BMPs for Australian cotton and help secure the integrity of product delivered to international mills.

As such, BMP is not just about protecting our current position but improving efficiencies across the value chain. Efficiencies in transport and storage begin at the gin and bale formation. Bale, density, shape, covering, strapping and tagging are all key components that need to be considered.

Dallas Gibb and Pete Johnson are currently drafting the BMP handbook, which will be overseen by CMSE Textile Technologist René van der Sluijs, who will commence the work in July, following approval from CRDC.

Following delivery of the draft handbook, initial preliminary audits will be conducted by René this year across a number of warehousing locations to determine compliance and further scope for the draft BMP.

"According to past experience these preliminary audits will lead to further amendments in the BMP," Rene said.

"This BMP will also need to be closely linked to the ginning BMP and any linkages will need to be discussed with the Australian Ginners Association.

"Once the initial BMP is ratified by the representative body formal audits will follow in 2011 with certification to BMP by Cotton Australia.

"Compliance with warehousing and dispatch BMP will then be assessed on a yearly basis."

Also within the forum there were also a number of specific issues addressed.

Bale Shape and Size

Its impact on loading of road transport / stacking in the warehouse / stuffing of shipping containers

AWH's National Logistics Manager - cotton, Graeme Wood, explains.

"Bale dimensions can have an effect on the loading configuration and the loading and unloading times. "Any increase here puts another unnecessary labour cost on the industry and more bales are subject to possible country damage.

"An uneven shaped bale can cause unsafe stacking within a warehouse and be the focus of OH&S as stacks may fall over injuring warehouse operators. Uneven bales also effect storage capacity with bales not being stacked as high and increase the time, cost to load and unload a truck.

"If bales cannot go three wide across a trailer, one bale is turned sideways and more bales are placed on the second tier, this creates a void on the deck of the trailer and the load has a higher centre of gravity. This combination can cause the load to be more unstable in transit from gin to warehouse."

Country Damage

Inspection and reporting requirements of bales at various transfer points (ie onto truck / off truck / in storage / out of storage)

Minimum requirements for storage of bales

Issues surrounding "shared storage" with other commodities

"The BMP post farm gate offers a great opportunity for the different sectors of the cotton industry to work together to ensure the quality and integrity of the bale is upheld through all processes from farm gate to mill," Graeme Wood says.

"Inspection and reporting requirements at the various points would make these sectors more responsible for their actions and reports could be acted upon immediately.

"Having minimum requirements on storage facilities will help in reducing infestation of insects, pests and residues. Shared storage facilities can create cross contamination issues and affect the Australian Cotton Industry's credibility in delivering a high quality product to the mill."

Bale Packaging

Discussions regarding cotton bagging versus hessian bagging, wire ties versus plastic ties.

Pete Johnson and other undertook a study to gauge mill preferences for wrapping.

"Around the world cotton bales are wrapped in a variety of packaging materials including fabric constructed from natural fibres such as cotton and jute/hessian, synthetics such as polypropylene and plastic films such as polyethylene," Pete says.

"Due to different sizes and densities, bales are tied differently, with differing materials used, including steel wire, metal strap and plastic strap.

"In Australia, the packaging methods utilised have largely evolved as a result of economic and practical issues at the gin level – some of which may not always 'gel' with handling and/or customer preferences.

"There may be opportunities to better align or standardise Australian bale packaging to meet the requirements of all stakeholders throughout the supply chain with minimal disruption to gin level efficiencies.

"From a storage, handling and marketing perspective, uniformity of bale packaging will add value to the entire crop, creating efficiencies throughout the supply chain, and consistency via standardisation will create 'delivery confidence' for our customers."

Moisture Management

There were discussions regarding 'tiered' BMP stages for storage and handling criteria so as to provide a semi standardised pathway towards Best Management Practice.

"The use of moisture is essential in the ginning process to maximise ginning efficiencies, maintain fibre quality and restore weight after cotton has been dried for cleaning," says ACSA Chair Arthur Spellson.

"If used incorrectly in the ginning process moisture can result in serious damage to the lint once pressed into a bale.

"Good communication between the ginning and merchant organisations is essential to making sure the quality of cotton is maintained in the gin and that ginners are given standards to work towards in the form of BMPs."

Moisture management plays a critical role in maximising the value of the crop for growers and protecting the reputation of the Australian cotton industry, according to Vice President of the Australian Cotton Ginners Association, Jeff Ballentine, adding that each stakeholder in the supply chain (growers, harvesters, ginners, warehousemen, marketers and mills) is interested in moisture management.

"In particular, when it comes to moisture management, ginners need help from the harvester.

Seed cotton in modules can be stored safety for long periods of time as long as the moisture levels are right. Too dry (3-4 percent) can result in result in staple and uniformity issues when the crop is ginned because the dry fibre can be brittle and does not stand up well when processed.

"Too wet (>12 percent) and modules will start to heat - and heat destroys grades.

"Once the seed cotton enters the gin it becomes a bit of a balancing act for the ginner.

"Crop residue cleans out with ease if the cotton is dry – but too dry will hurt quality. Too wet or trashy and the ginner will be adding a lot of heat to clean up the lint.

"Ginners target between five and six percent at the gin stands to ensure the fibre is robust enough to move through the lint cleaners without damage.

"When the cotton reaches the press however the ginner is targeting seven percent moisture.

"Too dry and the bale can be very difficult to press requiring an additional 200 tons of compression force to fully press a bale.

"Too wet (>8%) will cause the grade to drop in storage.

"Naturally high or uneven moisture in the bale is a concern for mills that pay for a certain cotton quality only to find it reduces in quality overtime.

"It's a bit of a *Goldilocks and the Three Bears* story but when you get the moisture 'just right' everyone in the supply chain benefits.

"The Australian cotton ginning industry has a great reputation which we must all work jointly to retain and develop."

Bt resistance contingency plan in development

Sharon Downes and Rod Mahon,
CSIRO Entomology and TIMS Bt Technical Panel

"Researchers recently discovered that the assumed baseline frequency of Cry2Ab resistance genes in populations is substantially higher than previously thought."

The frequencies of Cry2Ab resistance alleles in cropping populations of H. punctigera have steadily increased since Bollgard II® was adopted. This increase in Cry2Ab resistance alleles in *H. punctigera* is supported by data until the 2008/09 season from both of the screening methods (F1 tests and F2 tests) used in CSIRO's monitoring program.

In addition, researchers recently discovered that the assumed baseline frequency of Cry2Ab resistance genes in populations is substantially higher than previously thought. And as reported in a previous edition of Spotlight, a survey conducted in the channel country of western Queensland last winter, showed that the frequencies of Cry2Ab resistance alleles are significantly higher in *H. punctigera* populations from cropping regions compared to those from central Australia that are not exposed to Bollgard II®.

In response to all these findings, the TIMS Bt Technical Panel have developed a working document entitled "Contingency Plan for Mitigating Resistance to the Toxins Within Bollgard II® Cotton" which provides background information and recommendations for the Cotton Australia-convened TIMS Committee.

The Contingency Plan scopes possible measures to be taken in response to further increases in resistance frequencies to the Cry2Ab toxin in Bollgard II® cotton by Helicoverpa species. During 2009, the Contingency Plan underwent a process of consultative stakeholder review, as part of the TIMS Resistance Road show and the industry's REFCOM forum. It will be ratified by the Cotton Australia TIMS Committee in early 2010.

It is important to note that the Resistance Management Plan (RMP) will continue to be the document that informs growers of their responsibilities in managing Bollgard II® cotton. The RMP was established by regulatory authorities to mitigate the risks of resistance developing to either of the proteins contained in Bollgard II® cotton. The overall aim of the RMP is to prevent field level changes in resistance rather than react to them.

The Contingency Plan will be reviewed annually in light of new information on resistance frequencies in Helicoverpa spp. and new knowledge of tactics for Bt resistance management.

2009/10 mid-season resistance monitoring update

The screens used for Bt resistance testing take 5-10 weeks to complete so some of the insects collected for screening during the main cotton growing period may not be tested until as late as June. Mid season reports from the CSIRO Bt resistance monitoring program provide an early snapshot of any significant developments, but note that some of the frequencies in this report are based on relatively small samples.

Despite 12 years of exposure to the Cry1Ac toxin in Bt-cotton (first from Ingard and currently from Bollgard II), in natural populations of Helicoverpa there continues to be a very low frequency of genes that allow insects to survive this toxin. The following data relates to resistance to Cry2Ab.

H. armigera

At the end of January 2010, the frequencies of Cry2Ab resistance alleles in *H. armigera* were tracking at levels that were just below those detected at the close of 2008/09 monitoring.

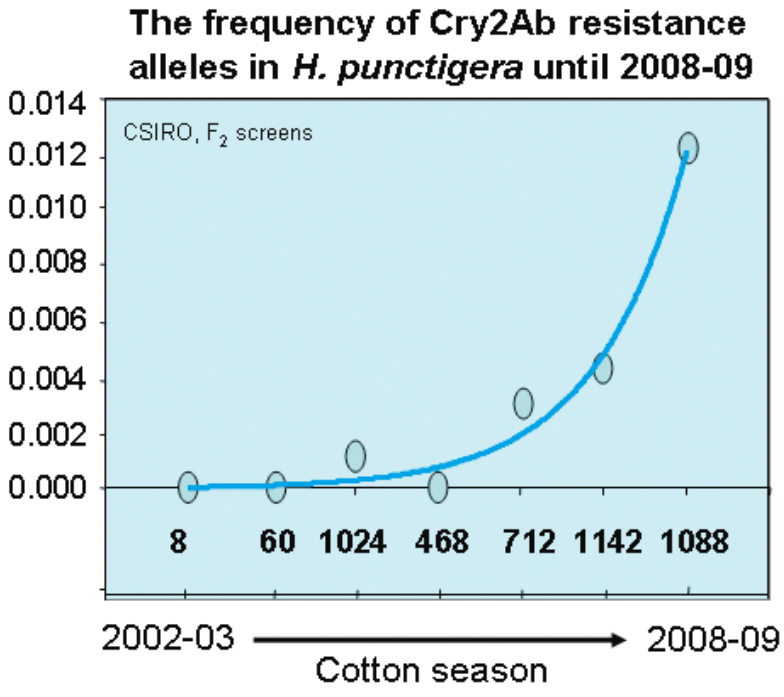
Negligible numbers of insects had been tested using F2 screens, and of the 648 alleles from *H. armigera* screened using F1 tests, there were 11 cases where the insects survived against Cry2Ab. The frequency of Cry2Ab resistance alleles in *H. armigera* until the end of January 2009/10 (0.017) is slightly lower than that obtained at the same time in December 2008/09 (0.023).

H. punctigera

At the end of January 2010, the frequencies of Cry2Ab resistance alleles in *H. punctigera* were tracking at levels that were lower than those detected at the close of 2008/09 monitoring.

Of the 664 alleles from *H. punctigera* screened using F2 tests at the end of January, four enabled the insects to survive against Cry2Ab (4/664 = 0.006). At the same time a year ago, the frequency of alleles conferring Cry2Ab resistance in *H. punctigera* was 0/208, therefore the frequency of Cry2Ab resistance alleles in *H. punctigera* thus far in 2009/10 is higher than at the end of January 2008/09.

F1 tests have been used to screen 686 alleles from *H. punctigera* and



Until the end of 2008/09, the rate of increase in Cry2Ab resistance genes in H. punctigera from the longer-term F2 test dataset best fits an exponential growth which means that the increases in frequency between years have grown over time. The frequency from the F2 tests with H. punctigera at the end of January 2010 was higher than at the same time in 2009.

Species	Year	Cry2Ab F1 screen		
		alleles tested	scored positive	frequency
H. punctigera	Full season 2007/08	194	2	0.010
	Full season 2008/09	640	30	0.047
	Total	1282	35	0.027
	At end January 2009	232	9	0.039
	At end January 2010	686	3	0.007
H. armigera	Full season 2007/08	278	9	0.032
	Full season 2008/09	3104	69	0.022
	Total	3736	85	0.023
	At end January 2009	712	16	0.023
	At end January 2010	648	11	0.017

Summary of results from the CSIRO F1 screens for Cry2Ab resistance including frequencies until the end of January in 2010, and a comparison with frequencies detected at the same time in 2009.

three of them conferred resistance to Cry2Ab. Two of these alleles were from the same individual that was homozygous (RR) for resistance. The frequency of Cry2Ab resistance alleles in *H. punctigera* until the end of January 2010 (0.007) was considerably lower than at the close of 2008/09 monitoring, and at the end of January in 2009 (0.039).

Future payoff from effective resistance management

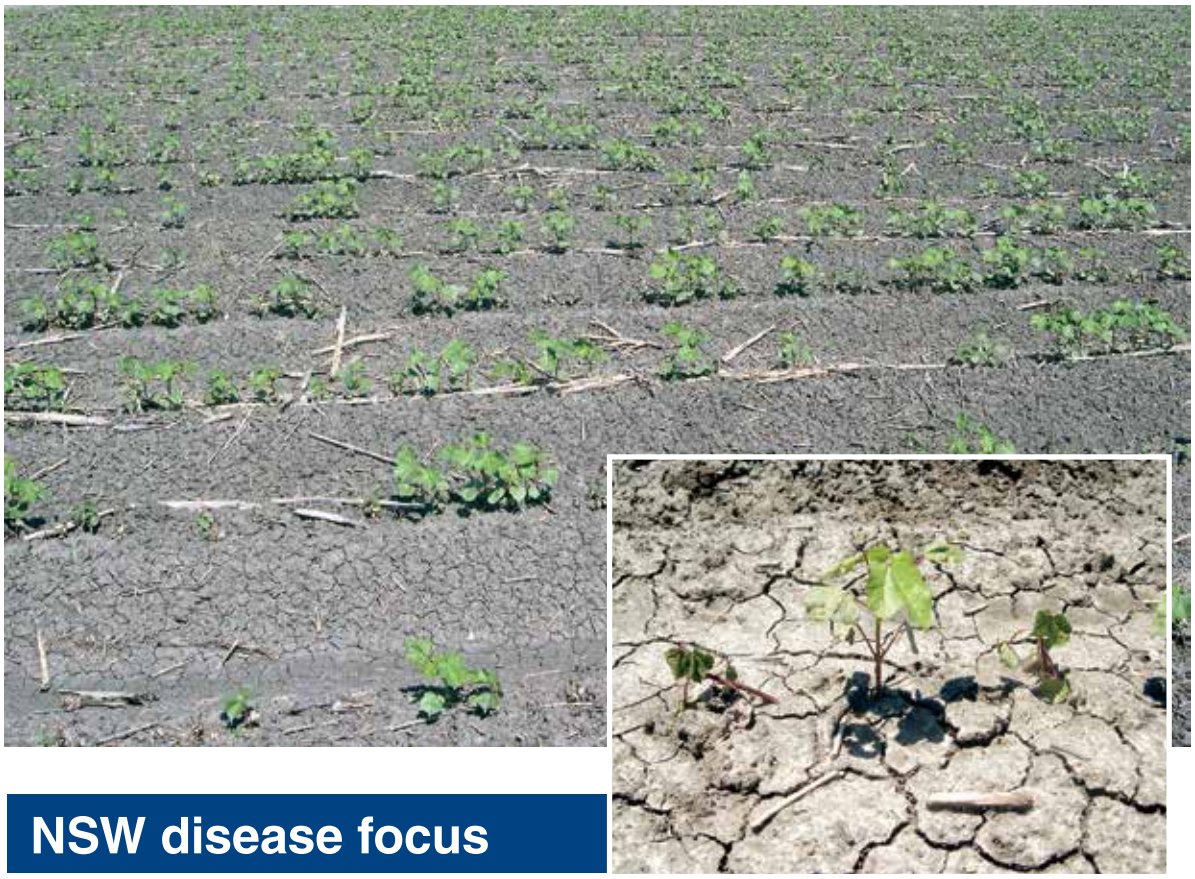
Monsanto's third generation Bt-cotton will build on the existing Bollgard II cotton platform. Protecting Bollgard II cotton therefore also represents an investment in the protection of future transgenic technology for the Australian cotton industry.

If field resistance to Bollgard II® cotton were to eventuate it may make it more difficult to market new transgenic products in cotton, and the perceptions of other industries, growers and the public could be unduly affected.

Modelling undertaken by CSIRO also suggests that Cry2Ab resistance levels in Helicoverpa spp. at the time of introducing the third generation Bt-cotton will directly impact on the requirements for the RMP for that technology. It is critical therefore, that the industry complies fully and effectively with the RMP for Bollgard II.

The Bt Technical Panel of TIMS are currently working with Monsanto to develop a RMP for 2010/11 that considers recommendations in the contingency plan and the early 2009/10 season results from the CSIRO and Monsanto Bt resistance monitoring programs.

The next scheduled review of the contingency plan is at the REFCOM meeting to be held in August 2010.



NSW disease focus

Rise in seedling mortality

At 40 per cent, the Macquarie Valley recorded the highest level of seedling mortality once again based on the early season report contained in the NSW Industry & Investment s annual cotton health check-up that surveyed growers from Griffith to Qld border.

Results also showed that average seedling mortality in NSW increased from 29 per cent last season to 32 per cent for the 2009-10 season.

NSW DPI plant pathologist, Chris Anderson, said unusually low temperatures at the beginning of the season, followed by record high temperatures in November had affected sowing and seedling establishment.

"Cool conditions gave the upper-hand to pathogens including Rhizoctonia, Pythium and Fusarium, to which many newly-emerged cotton seedlings succumbed and replants were common."

"Overall, sowing was generally delayed across the industry to avoid cool conditions in September and October – a positive result which reflects industry adoption of integrated disease management guidelines," Chris said.

"We saw significant stand loss in some areas where crops were sown in September.

"One crop in the Murrumbidgee did not emerge until four weeks after sowing due to prolonged cool conditions. We saw substantial increases in average seedling mortality across most growing areas.

Mr Anderson said black root rot caused by the soil borne fungus Thielaviopsis basicola also featured prominently in the early season survey, but plants outgrew the pathogen when conditions warmed up.

"While warmer conditions led to lower incidences and less severe occurrences of black root rot than last season, stunted seedlings struggled as moisture rapidly receded during the hot weather with some seedlings inevitably succumbing to water stress," he said.

Black root rot was detected on 18 per cent of plants and in 54 per cent of fields surveyed in the Macintyre, Gwydir, Namoi, Macquarie, Lachlan and Murrumbidgee Valleys and the Bourke/Walgett region.

In the Namoi 63 per cent of plants were infected by the pathogen and Mr Anderson said this was similar to last season.

"Although lower than last season, black root rot severity was again highest in the Namoi, it was also prevalent in the Macintyre and Gwydir regions, where many crops were sown into fields with a history of the disease under cool conditions from September to October."

Wireworm caused substantial stand loss in the warm conditions.

Since 1984 the NSW cotton health surveys have been conducted twice-yearly to provide the industry with up-to-date reports on the state of cotton crop.

The early season 2009-10 survey took samples at 82 cotton fields -12 in both the Macintyre and Macquarie Valleys, 11 in the Gwydir Valley, 20 in the Namoi Valley, 16 in the Lachlan and Murrumbidgee Valleys and 11 from the Bourke/Walgett region.

The next cotton survey in March 2010 will be looking out for Fusarium and Verticillium wilt, boll rots, hormone damage from chemical sprays and other late-season risks to plant health.

Data from the surveys, which is funded through the Cotton Research and Development Corporation and the Cotton Catchment Communities Cooperative Research Centre, helps to prioritise research directions and direct resources to where they will be most effective.

? A full report is not compiled until both NSW & Qld disease surveys are completed in the season. For further information on the preliminary survey 2010, contact Chris Anderson, 02 6391 3821
mailto:chris.anderson@industry.nsw.gov.au
View the I&I NSW website
http://www.dpi.nsw.gov.au/aboutus/news/recent-news/agriculture-news-releases/cotton-gets-health-check-up
A detailed interview with Stephen Allen is available on the CSD website
http://www.csd.net.au/wow/show/1451

Why ratoon and volunteer cotton must go

1. Mealy bug survive from one season to the next, infesting crops earlier in the following season

6. Build up inoculum of soil borne diseases such as black root rot, fusarium and verticilium

2. Cotton aphids with resistance to neonicotinoids survive from one season to the next, reducing the value of seed treatments and limiting foliar insecticide selections for aphid control

7. Extra selection pressure on Bollgard II cotton in 2 ways; 1. Cotton can be used as a host by the earliest and latest Helicoverpa generations, and 2. Ratoon plants may only express sub-lethal doses of the Bt proteins

3. Silverleaf whitefly survive from one season the next, infesting crops earlier in the following **season**

8. Fields with ratoons from Bollgard II cotton are unsuitable to be selected for planting refuge crops. Refuges cannot be effective if contaminated with Bollgard II plants

4. Pale cotton stainers have no winter resting stage and need malvacae hosts, like cotton for their development

9. Removing ratoons is a costly exercise - prevention is certainly cheaper than cure

5. Cotton aphids are better able to transmit Cotton Bunchy Top disease to a new cotton crop from ratoons

10. Biosecurity risk – they harbour pests for long periods they are a potential point of entry for exotic diseases, such as cotton leaf curl disease

Zero tolerance

Why ratoon and volunteer cotton must go

Tracey Leven, Manager, CRDC Farming Systems Investment

In Emerald this season the spotlight has been shining on the latest addition to cotton's insect pest complex – the mealy bug.

Some questions such as "where did it come from" may take biosecurity investigations considerable time to answer. The industry's priority is to act quickly to answer questions like "what can we do to minimise the damage this bug does to cotton in the future".

While still very early days, there is an element of déjà vu in what has been learned so far. The one thing that is already very clear is ratoon and volunteer cotton must go.

The risk of mealy bug infestation adds to the already long list of issues that ratoon and volunteer cotton make more costly and more difficult to manage.

Last season, Grant Herron, I&I NSW identified strains of cotton aphid carrying high levels of resistance to the neonicotinoid group of insecticides. In 2007/08 pale cotton stainers appeared in crops in many regions and removal of cotton volunteers was identified as an important way of limiting their survival on cotton farms between cotton seasons.

In 2006/07 Lewis Wilson's team at CSIRO completed work that showed due to the infection process, Cotton Bunchy Top disease was most likely to occur in fields that were in close proximity to ratoon cotton. And the list goes on, not just highlighting difficulties that ratoons and volunteers create for insect pest management, but also for soil borne disease risks and exotic disease risks.

In 2009/10, information about the occurrence of cotton plants surviving from one season to the next was collected during the annual disease surveys by pathologists from I&I NSW, Agri-Science Queensland (formerly QPI&F) & CSD.

This was the first time such information has been collected in the survey. Based on visits to 45 farms in NSW and 28 farms in Queensland, the team's data forms a baseline of industry performance in this key component of farm hygiene.

Clearly the warmer conditions through winter, coupled with more common use of back-to-back cotton crops, make this task all the more difficult for the central Queensland growing regions.

While NSW faired quite well in comparison this season, the report card may not look so good following a wet winter. This issue clearly deserves higher priority to reduce costs in the short term and protect the industry from a plethora of insect and disease threats that have the potential to impact the productivity and profitability of cotton over the long term.

Acknowledgements

Chris Anderson and Peter Lonergan, I&I NSW; Linda Smith and Linda Scheikowski, Agri-Science Queensland, a service of DEEDI; and Stephen Allen, CSD.

Images courtesy Lewis Wilson, Greg Kauter, Tracey Levin, Chris Anderson and Cherie Gambley

Survey of ratoon cotton on cotton farms in Spring 2009. Source: Chris Anderson, I&I NSW; Linda Smith, ASQ and Stephen Allen, CSD.

Frequency of mature cotton plants or regrowth stub cotton	NSW		Queensland	
	Number of farms with mature cotton plants, or regrowth from stub cotton surviving in;			
	Channels, tail water return systems, roadsides, fence lines	Current cotton crop	Channels, tail water return systems, roadsides, fence lines	Current cotton crop
Rare	13 (29%)	13 (29%)	2 (7%)	2 (7%)
Common	1 (2%)	0 (0%)	7 (25%)	10 (36%)
Numerous	1 (2%)	2 (4%)	2 (7%)	3 (11%)
TOTAL	15 (33%)	15 (33%)	11 (32%)	15 (54%)
CQ – Emerald & Theodore			9/11 (82%)	11/15 (73%)

No. mature cotton plants per farm: Rare = 1–10; Common = 11–100; Numerous = >100.

Rural communities can stand strong

Joint convenors of the April 19-21 conference, "Sustaining Rural Communities", Paula Jones, Research Programme Manager, Cotton CRC and Rohan Boehm, manager Communication and Capacity Building.

Widespread interest is on hand from all over Australia to take part in a conference convened by the cotton industry in April 2010. The conference will focus on how rural communities can remain vibrant and viable amid changing economic, environmental and social issues.

The conference will be held from April 19 – 21 at the Crossing Theatre, Narrabri with all sessions open to the general public at no charge.

The three-day conference is a joint project of CRDC and the Cotton CRC and is titled Sustaining Rural Communities - Social research for rural communities and all its industries.

Open for all people in the cotton industry, the event will be developed to allow direct input from researchers, regional communities and farmers.

Conveners, CRDC's Rohan Boehm and Paula Jones of the Cotton CRC say the industry has a substantial body of new research and insights that can allow the regional Australia to plan and act for the future.

"In the past few years, both CRDC and Cotton CRC have developed extensive research and important relationships across most rural industries, and 2010 has proven to be the ideal time to bring people together to grow their ideas and responses to the future of sustainable rural communities," Rohan Boehm, CRDC Program Manager Communication and Capacity Investment, said.

"A three day conference format has emerged as the most effective platform that will allow for the broadest range of knowledge, experience and research to be applied to the key question.

"This won't be set up as a talk-fest, we're targeting people with real experience and expertise to meet and mingle – then come up with real plans for their own rural communities and industries.

"Each day of the three day program will feature a theme and will have about a third on the research, a third on workshops and a third devoted to networks and planning," he said.

Day 1 - The Research - social research concerning rural communities and economies, impacts of climate change, drought, water reforms, resources boom and global food/ fibre security.

Day 2 - The Workforces - responses to creating and sustaining regionally flexible workforces with resilient communities.

Day 3 - The Capacity - the culture of learning, leadership and building the capacity of rural people and their communities.

"We look forward to being able to bring together a number of interested people at this first conference of its type," says co-organiser Dr Paula Jones, Cotton CRC Research Program Director.

"Already we have registered interest from as far as Western and South Australia, which signifies the need for this type of conference, and will ensure a great demographic of delegates which will no doubt benefit all attendees.

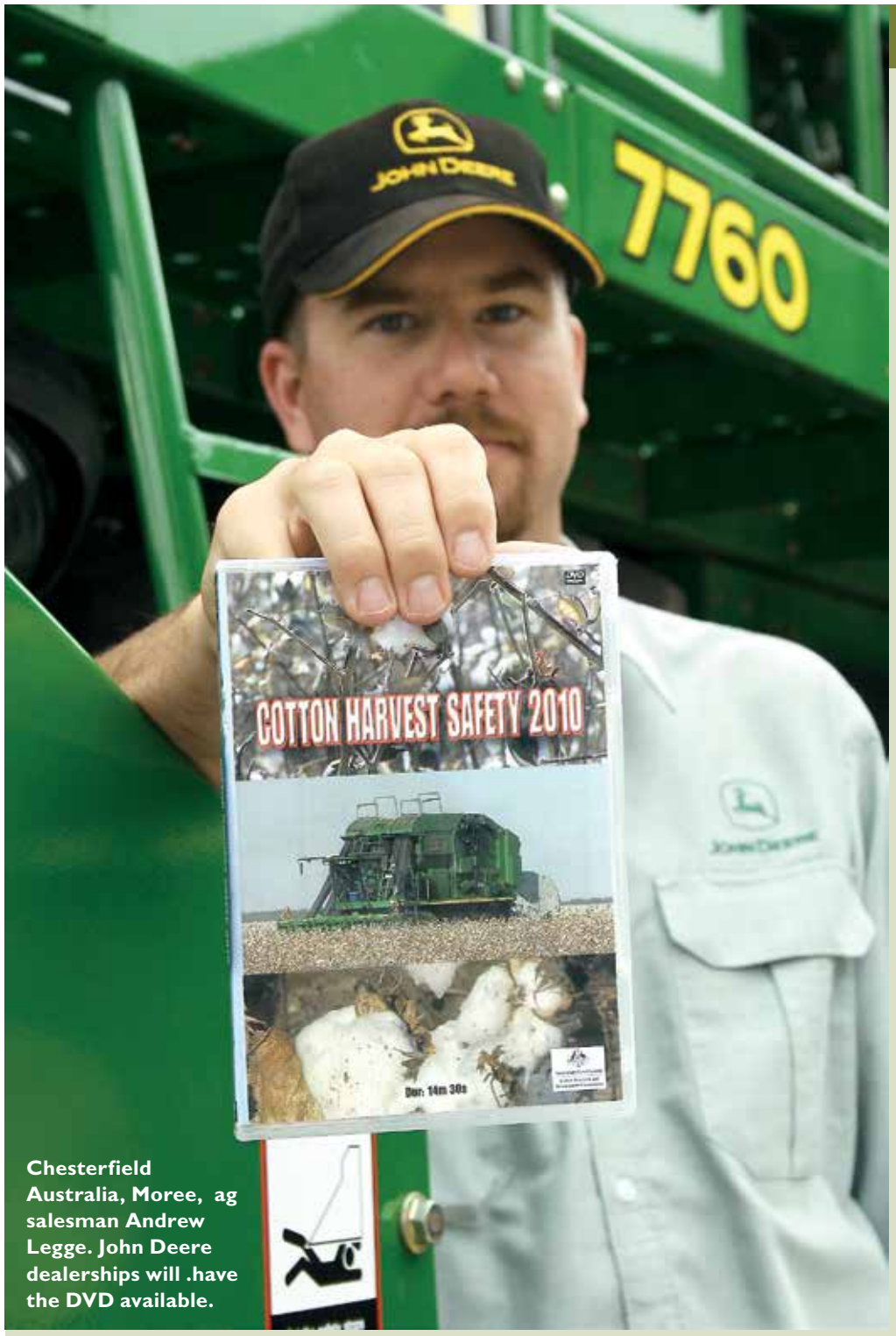
"Most rural communities are facing similar challenges, so there is a great opportunity on offer for people to come and hear how to try to overcome these issues as well as network among each other to learn how others have sustained their communities," she said.

Thefull program will be available in early March and delegates who are interested in attending the conference should register now at www.cottoncrc.org.au

? For more information contact Kate Schwager on 02 6799 2477 or e-mail kate.schwager@csiro.au

Register to attend this important industry meeting.

It's free!



Chesterfield Australia, Moree, ag salesman Andrew Legge. John Deere dealerships will .have the DVD available.

New DVD

Arrive home alive from the 2010 picking

Knowledge of what to do to avoid death and injury on the job is a vital concern for all employers, and employees. Addressing this urgent need, cotton producers and picking contractors are set to benefit from the all-new Safe Harvest DVD produced by CRDC in readiness for the coming 2010 picking season.

Convenor of the DVD production, Helen Dugdale, urges industry to take a deadly serious view on safety because on-farm deaths and injuries are preventable, yet remain a constant threat for every farm.

"Everybody who goes to work has an expectation of arriving home safely, but safety is a team effort and everyone needs to be on the same page in having a team plan for the wellbeing of fellow workers," Helen said.

"We've ensured the 12-minute production is packed with key messages for on-the-job inductions for new employees as well as experienced operators.

"We all have a responsibility to drive a cotton industry workplace culture where prevention of injury during the picking season is of primary concern to all employers and employees.

"The short film covers safety topics ideally suited to all persons in the cotton picking workplace and covers worker site inductions, communication, powerlines, maintenance, night-work, fire hazards, transport, machinery and equipment.

Distribution of the DVD will be through machinery dealerships, Cotton Grower Associations, picking contractors, extension personnel and CRDC. The Summer edition of Spotlight magazine has a full-page report on the DVD production and that included a summary section on safety around powerlines. CRDC thanks the valuable sponsorship and logistical support for the production provided by the John Deere company.

? For further information, contact Helen Dugdale at CRDC 02 6792 4088 mailto:helen.dugdale@crdc.com.au

All Spotlight magazines now e-Publications

The e-publishing world has reached the cotton industry with the establishment of an all-new online publishing service for CRDC's quarterly Spotlight magazine.

In February, CRDC loaded all editions of Spotlight magazines published from winter 2007 on the CRDC website in a novel new 'page-turner' format. This new format allows all internet users to view 11 Spotlight magazines online. CRDC communication manager Rohan Boehm said the new service would rapidly spread to all CRDC publications and in the future, significant reports produced by CRDC would also be available in the new format.

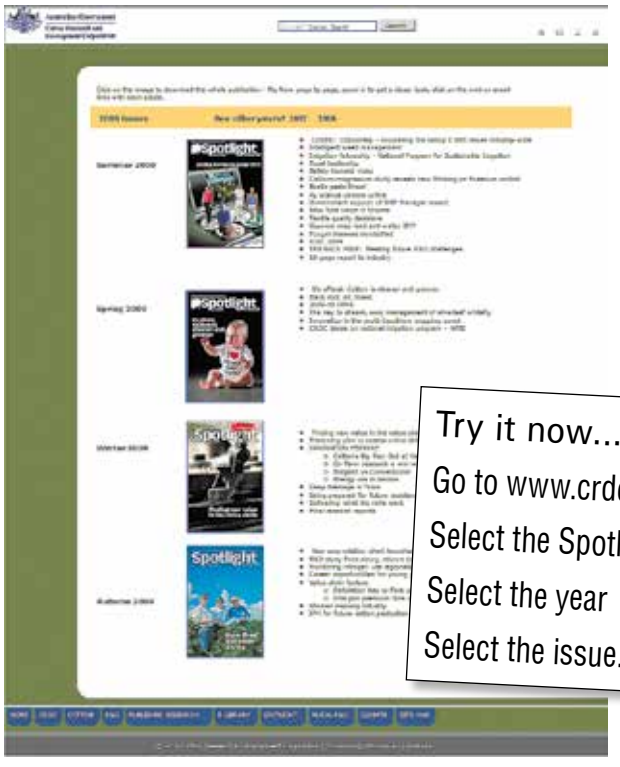
"This is not the end of the printed magazine format, instead it allows for easier access to older publications where there is plenty of valuable information stored.

"The key advantage of this new technology is the very small bandwidth required to successfully read large publications and reports online.

"CRDC will progressively enhance its online information resources and the e-Publication format is the centrepiece technology to allow this to occur."

"The new format allows readers to quickly flick through a publication on the computer screen and to zoom in on pages of interest, in much the same way as a printed publication would be read. Each publication has its own 'search-engine" which allows for content in a particular issue to be quickly searched. Over time, we'll improve the service based on what readers think and how the technology evolves."

? Contact Rohan Boehm, CRDC 02 7692 4088
mailto:rohan.boehm@crdc.com.au
Website link: http://www.crdc.com.au/index.cfm?pageID=140



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Select the year
Select the issue.

Can we meet future energy challenges?

Bruce Pyke, General Manager R&D Investment CRDC

Everyone has noticed that our energy costs are increasing. This has occurred before the scientific and political debate on climate change has been resolved and a decision made on the best policy instruments in response. What can be expected is that energy costs continue increasing, whatever the response.

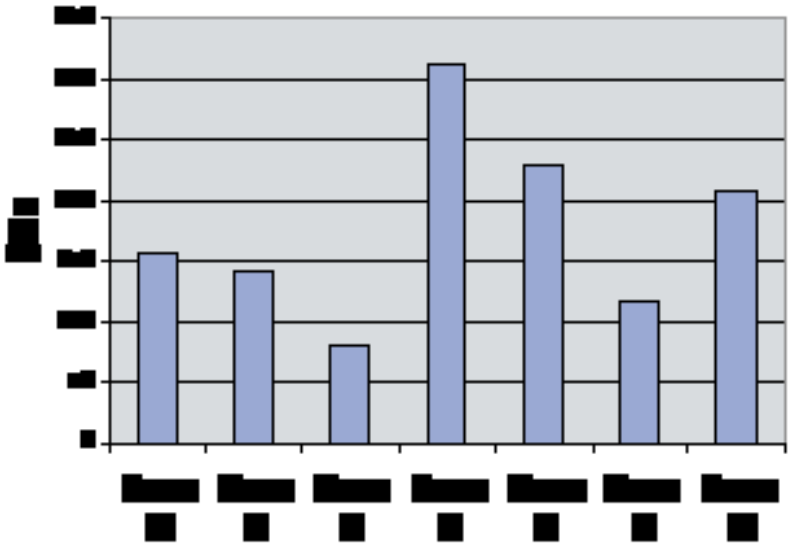
CRDC has been asking how R&D can respond to increasing energy costs and how the cotton industry can be better prepared for a future that is expected to see reduction in liquid fuel supplies.

In 2007, CRDC commissioned the National Centre for Engineering in Agriculture (NCEA) to conduct a series of case study energy audits on cotton farms. The report on this work showed that energy use the case study farms varied significantly from farm to farm with the range from 3.7 to 15.2 GJ/ha costing $80 to $310/ha (see Figure 1).

Greenhouse gas emissions associated with this direct energy use was estimated to be between 275 and 1404 kg CO_2-e /ha - see the following link for the report (http://www.ncea.org.au/images/stories/pdfs/NCEA%20Final%20Report%20for%20Energy%20in%20Cotton.pdf).

Note that this study did not include the indirect energy and emissions associated with the production of the fertiliser and pesticides used. Cotton Incorporated in the US has estimated that, in irrigated cotton, energy use from the production of these inputs is equivalent to the energy used in the production of the crop.

Figure 1 Total direct energy costs of case study farms (cotton production only) – source Craig Baillie, NCEA

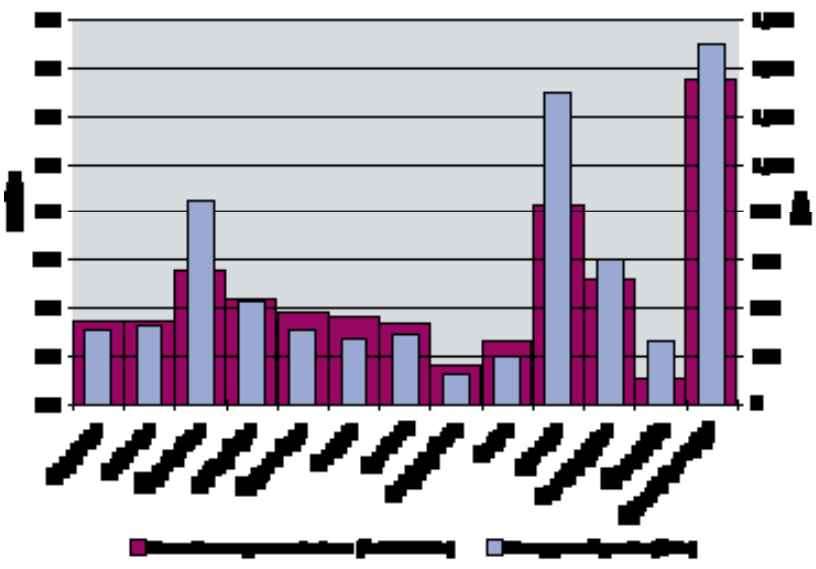


This NCEA study suggests that, in irrigated cotton, average energy related costs and greenhouse gas emissions (0.712 t CO2-e per ha) appear to be equal to average costs and emissions from fertiliser use (0.67 t CO2-e per ha – AGGI 1990 to 2007). A key message from this preliminary study is that a focus on improving on-farm energy use efficiency appears to be as important in irrigated systems as improving nitrogen use efficiency.

In cotton systems, water pumping is often the major energy use operation. Several more detailed examples are now available to show that significant efficiency gains (and in some cases crop productivity gains) can be made by optimising pump performance - current examples range from 10 – 67 percent reductions in diesel costs and in some cases improved pump efficiency can lead to increased water flow, more timely irrigation and improved crop yield.

The energy calculator developed under the NCEA project, EnergyCalc, was adapted under a subsequent QFF funded project to measure a range of primary production systems, including cotton, grains, sugar, horticulture, nursery and aquaculture – see the following link for more detail (http://www.ncea.org.au/images/stories/pdfs/QFF%20Energy%20Efficiency.pdf). Figure 2 compares energy use in the production of a number of intensive industries in Queensland (source Craig Baillie NCEA).

Figure 2. Energy use in the production of a number of intensive industries in Queensland



In the cropping sector a number of practice changes and technology developments have been, or are being, adopted which can be expected to reduce fuel/energy use or energy use intensity.

Examples include minimum/zero tillage, controlled traffic, a range of precision ag technologies, planting of GM crops, some water use efficiency measures and use of legumes in crop rotations. Unfortunately, because the primary driver for the adoption of these practices and technologies has not been energy costs or efficiency, relatively few studies appear to have considered the energy savings or efficiencies associated with them.

Last year CRDC funded the NCEA to conduct a case study to benchmark the energy use reductions resulting in the adoption of reduced tillage systems on the cotton farm "Keytah" in the Gwydir Valley. The study showed that adoption of a minimum tillage system had reduced energy costs (and greenhouse emissions) by 12 percent since 2000 and developing a "near zero till" system had the potential to reduce this to 24 percent less than 2000 energy costs.

The integration of diesel-gas systems to reduce reliance on diesel fuel on this farm also shows considerable promise. See *Spotlight* Winter edition 2009.

CRDC believes there is substantial scope to improve energy use efficiency in cotton production systems, but to enable more growers to identify where they can improve, further on-farm measurement and development of tools, processes and human capacity is required. In addition, CRDC has invested in an initial study of energy use in cotton gins (see *Spotlight* Spring edition 2009).

Interested in Peak Oil? See page 32

High yielding with high WUE, Bollgard II can be grown by varying irrigation deficits during flowering in response to plant stress.

Tailoring irrigation frequency improves yield and efficiency

By Chrissy Brown

Stephen Yeates has undertaken comprehensive studies into the most efficient way to irrigate Bollard II

Varying irrigation deficits in response to climate by minimising moisture stress during flowering in Bollgard II varieties by can improve cotton yield and WUE particularly under hot, dry growing conditions.

This was a key finding in a project lead by Stephen Yeates in a joint R&D investment from CRDC, Cotton Catchment Communities CRC, and CSIRO. The project focused on optimising the crop response to water when growing Bollgard II varieties.

Having evolved from earlier research in 2005 after Bollgard II was released that showed the plant would grow differently to conventional cotton by setting significantly more early fruit due to less insect damage, it was found that Bollgard II had such a high fruit load late in flowering that water stress during this period would greatly reduce yield.

Experiments conducted in collaboration with Dirk Richards at ACRI where full irrigation (traditionally used for conventional) was compared with stress at various stages showed that yield was reduced by 36 percent and 17 percent in the Bollgard II and conventional varieties respectively after skipping an irrigation at the cut-out stage, reports Stephen.

It was realised that a high boll load early in flowering can lead to premature cut-out and lower yields.

A conclusion in the work identified that researchers would need to revise water management for this new high fruit retention plant.

The research aimed at tailoring irrigation scheduling that could combine soil and plant based measurements of plant stress for the purpose of optimising the yield and water use efficiency of these high retention varieties.

Carrying out trials for three years starting with the 2006/2007 cotton-growing season provided considerable data from which growers are now improving their irrigation scheduling for Bollgard II production.

Frequent watering or low deficit irrigation scheduling (40mm deficit or every six to seven days) increased Bollgard II yield by 17 percent and water use efficiency (WUE) by eight percent when conditions were hot and dry during flowering, as in the 2006/07 and 2008/2009 seasons.

"Traditionally in situations where water availability was limited growers would hold off on irrigating if likely rain was imminent," Stephen said.

"With Bollgard II, yield will be reduced if hot, dry conditions cause moisture stress at cut-out so growers really need to judge the season.

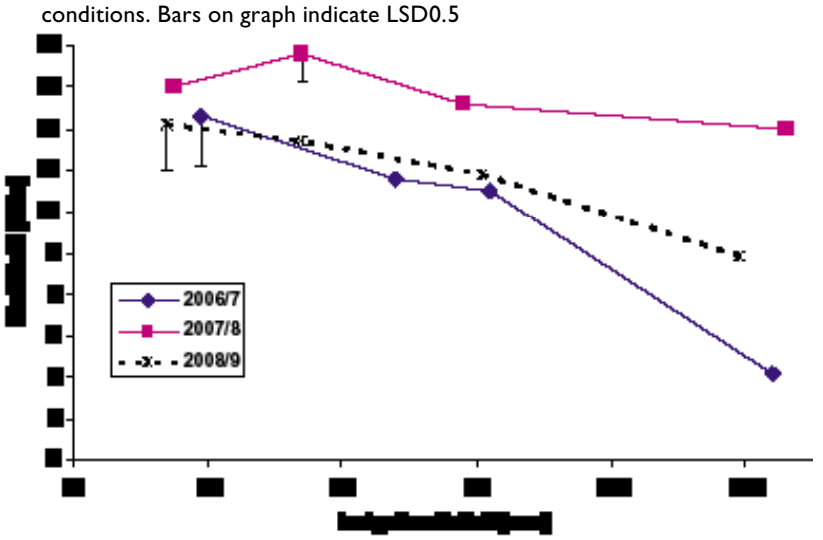
"It is important to note that the deficit in millimeters will vary with soil type which highlights the importance of using the plant as an indicator of stress rather than using a generic deficit measure."

Growers would also need to consider the farm specific irrigation application efficiency trade-offs before adopting low deficit scheduling, he said

It is important to note that in the hot, dry seasons during flowering of 2006/07 and 2008/09 irrigation at smaller deficits generally had higher

"It was found that Bollgard II had such a high fruit load late in flowering that water stress during this period would greatly reduce yield."

Figure 1: The irrigation deficit for maximum yield also varied with seasonal conditions. Bars on graph indicate LSD0.5



WUE due mainly to higher yields. Trials also showed that where growing conditions were mild, scheduling irrigations to a greater deficit (54 to 78mm deficits) maximised yield and the WUE by having captured more in-crop rainfall than irrigating at 40mm deficit.

"Mild conditions provide relatively high in-crop rainfall and lower evaporative demand during flowering, which occurred in the 2007/08 season, so moisture stress is considerably less during this critical period," Stephen said

In his final report Stephen Yeates showed that lint yield differences could be explained by the contribution of bolls from later pollinated flowers located toward the 'top' of the plant and vegetative bolls. It is shown that only in the extreme stress situation observed in 2006/7 where a large irrigation deficit (126mm) was combined with high temperatures, low in-crop rainfall and large evaporative demand was yield from the 'bottom' of the plant significantly less over three seasons.

"If you frequently water in a mild season the crop would probably yield well but water use efficiency would be lower and it would depend on the field if waterlogging would affect yield," Stephen Yeates says.

"An important finding from this project is that tactical irrigation management can be used for water use gains."

Research findings also illustrate that if plant based measurements could be improved, there could be some big gains to production and WUE.

Data demonstrated that varying the soil water deficit trigger in response to plant/climate measures of water stress should improve the efficiency of irrigation water use and permit more effective use of in-crop rainfall.

The project also answered another frequently asked question as to whether Bollgard II or conventional cotton is more efficient at utilising water. It was found that insect damage from Helicoverpa was the key factor to determining if conventional or Bollgard II varieties has better WUE.

Where damage is minimal, WUE was the same for both types. However, in a situation where insect damage was moderate or high Bollgard II used less water than the conventional variety because of the longer growing time required compensating for the damage in conventional.

In contrast, where early tipping was the only insect damage to the conventional variety it had better WUE and higher yield than Bollgard II due to the improved canopy structure.

The most significant message from the study is that varying irrigation deficits if linked to measures of plant stress will improve cotton yield and WUE.

In his final report Stephen states that "These benefits if adopted will impact on 75 percent of Australia's irrigated cotton that is grown in a sub-humid climate with significant but variable in-crop rainfall and evaporative demand."

Moisture stressed Bollgard at cut out – Steve Yeates found large yield reductions are possible in this situation through his studies.

Irrigation Deficit (mm)	WUE (bales / ML ETc)		
	2006/07	2007/08	2008/09
32 – 39	1.61	1.65	1.58
50 – 68	1.57	1.79	1.57
72 – 82	1.49	1.69	1.55
109 – 124	1.03	1.64	1.37

Table 1: The irrigation deficit where WUE was maximized varied with seasonal conditions. WUE was calculated as bales /megalitre of evapotranspiration. NB: the irrigation deficit was calculated as the water used from two days after irrigation until the time of the next irrigation.

Deficit (mm)	2006/7		2007/8		2008/9	
	Bottom	Top	Bottom	Top	Bottom	Top
32–39	6.3	6.0	5.7	7.3	4.9	7.2
50–68	6.3	4.4	6.4	7.4	5.6	6.1
74–82	6.3	4.2	5.9	6.7	5.5	5.4
119–126	4.2	1.9	6.2	5.8	5.0	3.9
lsd0.05	1.38	1.16	ns	1.11	ns	0.71

Table 2: Scheduling irrigation to ensure concurrent growth of bolls and new flowers (top) during flowering was essential for high yields in Bollgard II cotton. Where (bottom) is yield from P1 bolls on 1st 8 fruiting branches (FB) + P2 bolls on 1st 4 FB and Top = yield from bolls from rest of the plant that flowered later. Yields are bales / ha.

NATIONAL PROGRAM FOR
Sustainable Irrigation

Pictured at Moree are, from left, Bruce Finney, Executive Director of the Cotton R&D Corporation, Minister of Agriculture, Fisheries and Forestry, Hon Tony Burke, National Program for Sustainable Irrigation Program Manager Guy Roth, and Keytah manager and National Program for Sustainable Irrigation Management Committee member Andrew Parkes.

Minister sees value in irrigation publication

On a visit to the "Keytah", a mixed farming property at Moree last month, Federal Minister for Agriculture, Fisheries and Forestry Tony Burke inspected farmer led irrigation demonstration sites and launched Irrigation Essentials, a new compendium of irrigation research of the National Program for Sustainable Irrigation (NPSI).

Irrigation Essentials summarises irrigation research, as well as detailing future challenges and opportunities for irrigators and the irrigation industry.

"We need a combination of practical on ground farmer led demonstration sites that I have seen today, and technical resources like *Irrigation Essentials*," the Minister said.

"It provides key principles and technical information that I hope encourages irrigators to look at new opportunities and see what is on the horizon.

"Research findings, while important in the continuing quest for sustainable and productive use of limited resources, require adoption and often modification to suit regional situations.

"*Irrigation Essentials* is a welcome document because it not only provides case studies to demonstrate how research and good ideas may be adopted, but also provides guidance on where to find additional information on key topics."

The booklet is jam-packed with research and innovation for Australian irrigators, outlining the latest research and approaches to issues facing all sectors of irrigated agriculture.

It will help cotton growers, advisors and researchers identify and manage improvements on-farm to increase water use efficiency, thereby gaining better value from this valuable resource.

Produced by NPSI, of which CRDC became managing agent last year, the publication covers irrigation enterprise establishment and management, irrigation methods, business management, creating a water budget, scheduling and monitoring, agronomy and soil considerations, plus a host of other valuable information for irrigators.

NPSI Program Manager Guy Roth said efficient irrigation was crucial if irrigators are to remain globally competitive.

"Australian irrigation research has led to new technologies and detailed management guidelines that help irrigators adapt these techniques to suit individual farms," he said.

"This publication harvests the key principles of efficient irrigation from the NPSI program and other research, along with examples of leading-edge technology.

"The principles provide a checklist for irrigators and a framework for the adoption of new technologies."

The Minister's visit, hosted by "Keytah" owners Neil, Ann and David Statham with manager Andrew Parkes was also intended to understand the impact of drought on the cotton industry and its communities.

CRDC Executive Director Bruce Finney was at the informal meeting, saying it was an excellent opportunity for himself, Cotton Australia Chair Joanne Grainger and CEO Adam Kay to discuss relevant industry policy matters and for CRDC Chair Mike Logan to highlight the impact of R&D on sustaining productivity growth.

Bruce Finney discussed with the Minister how drought had impacted industry production over the past seven years and that in the current season, production would be unlikely to reach half of the industry's historic production levels.

"It's been very difficult for everyone and we look forward to better operating conditions," he said.

"Positively throughout the same period the innovativeness of growers, supported by world leading R&D, has enabled nearly a 30 percent gain in yields.

"This remarkable achievement has been possible through the adoption of ever improving Australian bred varieties and advances in management practices. Significant gains in water use efficiency, energy use and more adaptable farming systems are but some examples of these advances," Bruce Finney said.

? For further information on the National Program for Sustainable Irrigation (NPSI) or to download your own copy of Irrigation Essentials, go to the NPSI website www.npsi.gov.au To receive a printed copy, mail:npsi@crdc.com.au

New knowledge site: an up-close look at irrigation systems

Jason Seigmeier, "South Bunarbah" and Roo Forster, "Eagle Farm" Mungindi. "I'll be very interested to come back and see the progress," Roo said.

> "...growers know more than anyone what they want to know.."

By Melanie Jenson

Improving irrigation management in the Gwydir Valley and beyond is the aim of a two-year on-farm trial into cotton irrigation systems. Conducted at "Keytah", Moree, the trial is part of a new and collaborative approach involving a local irrigators' association with water efficiency initiatives of the federal government.

Overseeing the research is John Doble. John is employed by the Gwydir Valley Irrigators Association with support from the National Water Commission. The site of the trial is also part of a pilot program to develop grower-led national irrigation "knowledge sites" which remain open to other growers to inspect and to review as a learning experience.

The Keytah trial may be the first time a study of this scope and scale on a single farm under the same management system is undertaken. The trial covers four irrigation systems: drip, furrow, overhead lateral and bankless channel. The scale trial allowed scientists to incorporate as many variables as possible to produce an un-biased comparative view of each system.

The trial seeks to compare the inputs and outputs of labour, water use efficiency, capital requirements, fertigation benefits, pressurising costs and plant water availability.

Dubbed a "knowledge site", it aims to give irrigators a first-hand look at different irrigation systems and management.

As part of the annual GVIA Irrigation Field Day, growers from around the Gwydir region converged on "Keytah" in November '09 to see the trial and talk with industry experts. Positive and encouraging feedback from growers reinforced its value as an irrigation systems trial site.

Many said they would like to revisit the site to follow the crops' developments – especially in the bankless channel, drip and overhead sites that are the less common irrigation methods for cotton production.

"We also had a big focus on open discussion. Growers know more than anyone what they want to know," Mr Doble said.

"We aimed to provide a forum for growers and industry experts to interact, and this site allows us to do this."

John Doble and GVIA CEO Mike Murray, said feedback surrounding the trial was encouraging.

"Growers response to the Irrigation Efficiency Seminar was strong, and we have ongoing enquires directed at the drip and bankless channel systems," John said.

"As the crop has developed, strengths and weaknesses of each system become apparent.

"How each system is managed and problems are overcome is important information for any growers who may be considering taking on any of the four systems that are on trial.

"By researching these systems, we now are helping growers make more informed decisions regarding their future irrigation systems.

"It is encouraging to discuss the opportunity's each system offers with growers that really consider adopting new methods of irrigation so as to better their returns, efficiency and eventually the cotton industry as a whole."

According to National Program for Sustainable Irrigation program manager Guy Roth, the development of a network of learning and knowledge sites around Australia would increase the adoption of research and development.

"There is a need to increase the opportunities for irrigation farmers to engage with the possibilities available to them if they adopt the latest knowledge and technologies," Guy said.

"This can be achieved through the establishment of a network of regionally located key learning sites that demonstrate the application and benefits of new water use efficient technologies and infrastructure.

"A formal National Irrigation Systems Comparisons Learning and Knowledge Sites Initiative would enable farmers to learn more and participate in managing the different systems for different crops and allow them to gain the knowledge, skills and importantly confidence to make major water investment decisions and manage them effectively.

"Adults learn by doing and are strongly influenced by people they trust in their local environment. Farmers trust other farmers more than any other source.

"If farmers are going to upgrade their systems, to convince them of the business investment merits, it will require higher quality information from their region than is currently available.

John Doble has been employed by Gwydir Valley Irrigators Association to help improve efficiency in the area, and oversee grower-led trials of four irrigation systems at "Keytah" Moree.

"Irrigation systems comparisons have been made in the past. But when you examine the detail of these, they are seldom truly comparable and would have knowledge gaps arising from being done in a different region."

"A national network would link the Keytah site with other system comparison projects to spread the knowledge generation and learning across industry commodities and regions.

"To accelerate change both the business decision making and technical knowledge processes need to be targeted," Guy said.

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"Opportunities for closer communication on existing issues, or potential new collaborations between CRDC and GRDC, have been identified ..."

Cotton and grain discover common R&D ground

Mary Ann Day

Steps taken to achieve closer collaboration between the Grains Research and Development Corporation (GRDC) and CRDC in 2009 have helped to forge an even stronger working relationship between the two organisations, according to Bruce Pyke, CRDC's General Manager for Research Investment.

He explains that since first making a commitment for a stronger working relationship 12 months ago, CRDC and GRDC program managers have met together twice to ensure the full range of collaborative opportunities could be discussed.

"The outcome has been a clearer understanding of opportunities to improve communication, collaboration and co-investment in areas where we have a common interest," Bruce said.

"Both corporations recognise that, over time, we have developed different timelines and processes for procuring R&D for the benefit of our industries.

"These differences can sometimes frustrate research providers that apply to both organisations for project funding. However, by providing regular opportunities to meet and discuss common issues, new connections and more effective ways for CRDC and GRDC to work together are emerging."

One example of a potential new connection includes an invitation by the GRDC for CRDC to consider joining a new phase of the National Invertebrate Pest Initiative (NIPI).

Another new connection was created recently when CRDC sponsored University of Queensland's Centre for Pesticide Application and Safety (CPAS) to run a workshop on modelling of drift from ground based pesticides applications. GRDC representatives were invited to this workshop and as a result have held further discussions with CPAS regarding possible future developments in this area.

"Both teams met in Sydney in May and again in October 2009," Bruce said.

"On each occasion it has not been a problem to identify a list of topics around which we had common interest, but in fact it has become more of a challenge in keeping the list of issues short enough so that we could discuss them all effectively during a meeting!"

At each of the 2009 meetings, a summary and action sheet was developed and circulated, listing the issues discussed, what was resolved and who was responsible for any further action.

"In addition to the overall communication value of the twice yearly team meetings, many items on the action list from each meeting deal with opportunities for further communication between team members or other members of the CRDC or GRDC staff on more specific projects or issues," Bruce says.

"While opportunities for either closer communication on existing issues or potential new collaborations between CRDC and GRDC have been identified at these meetings, they have also provided an opportunity to discuss progress in areas in which we already co-invest."

These include water management and benchmarking, through a joint project managed under the National Program for Sustainable Irrigation (NPSI).

The CRDC and GRDC fund parallel projects in pesticide spray application and drift management programs and they are linked by a common advisory committee.

Additionally, research on the key soil elements phosphorous and potassium in northern NSW and southern Queensland has been commenced, with co-investment by CRDC and GRDC and project management by the GRDC.

The two are also working together to improve farm health and safety through RIRDC's Collaborative Partnership for Farming and Fishing Health and Safety.

"A project monitoring insecticide resistance in Helicoverpa spp is also a vital joint investment," Bruce says.

"It is noteworthy that our existing co-investments are managed through a number of different arrangements which is an indication there is a willingness for both corporations to be flexible in achieving co-investment opportunities and outcomes."

Looking ahead, he said there were also a number of potential new areas that could be considered for future co-investment.

"These areas include a possible new phase of the Managing Climate Variability Program, focusing on future irrigation R&D needs, opportunities in soil biology R&D, exploring options on on-farm energy use efficiency improvement and alternative fuels, together with scoping joint publications, particularly for summer crops or cropping systems, involving cotton and grains.

"The CRDC and GRDC teams are planning to meet again in April at Narrabri where there will be an opportunity to visit farmers and researchers with whom ideas for future collaborative R&D will be discussed."

Promoting the establishment of the Undergraduate Studentship Program are PICSE 'experts' with Federal Minister for Agriculture, Fisheries and Forestry Tony Burke at the Investing in Youth for Agriculture workshop recently are Charlotte Berrill, Claire McCrory, Tiffany, Knowles, Rosie James, Gary Cahill, Bonnie

Ag science undergraduates – apply now for scholarships

By Mary Ann Day

Agricultural science undergraduates are eligible to apply for new scholarships in a new project designed to respond to the national shortage of graduates which are essential to the future of a productive agricultural sector. The undergraduate project is supported the cotton industry and by by many other rural industries through their Rural R&D corporations.

In 2010 the project begins as a pilot by offering undergraduate scholarships to students all over Australia who are studying agricultural sciences in the 2010 academic year.

The Investing in Youth Undergraduate Studentship Program is being managed by the Rural Industry Research and Development Corporation (RIRDC) on behalf of the participating rural R&D corporations which include CRDC.

"Rural industries have decided to work with current undergraduate scholarships and other initiatives to counter the current rural skills shortage," explained Edwina Clowes, Scholarship Manager for the program.

"This shortage affects the supply of primary industries researchers, teaching academics, rural leaders and skilled labour.

"The chronic shortage has been emphasised by current research that points to a 35 percent gap between supply of agricultural graduates and the demand for their qualifications within five years.

"Through the introduction of a coordinated undergraduate scholarship and mentoring program, we hope to restore some of the balance in these areas."

In 2010, the Investing in Youth program pilot supports up to 10 undergraduates, two from cotton, to commit to a career in primary industries through a comprehensive scholarship program that provides financial support, a mentor to support students with career advice and direction, career relevant industry placement and employment opportunities during and after undergraduate study.

"Each scholarship includes financial support for four years to assist with the cost of study and a mentor and industry network to support students with career advice and career relevant vacation industry placement and employment," Edwina said.

"We have received 70 applications from secondary students across the country, so the response has been excellent.

"Through this scholarship, students have a financial incentive to study primary industries, which will help take the financial pressure off, allowing them to focus more fully on undergraduate studies."

The primary industry network and student alumni to be established as part of the program will give students a sense of belonging and direction, while providing scholarship winners with career advice and exposing them to career opportunities, 'invaluable in cementing in them a tailored career path in primary industries', Edwina said.

"With the support provided by the program we hope to increase the number of undergraduate students committing to and completing tertiary studies and taking up a career in primary industries, so helping to arrest the critical shortage."

? For further information, contact Edwina Clowes, mailto: clowesedwina@bigpond.com

Canberra workshop promotes "Investing in Youth for Agriculture"

The Rural Industries Research and Development Corporation (RIRDC) recently hosted a workshop and dinner in Canberra promoting the establishment of the Undergraduate Studentship Program, announced by Federal Minister for Agriculture, Fisheries & Forestry, Tony Burke. The Primary Industry Centre for Science Education (PICSE) flew in eight students involved in the PICSE programs from all over Australia as "experts" in the field, to provide advice to the select group of agricultural R&DC and industry stakeholders at the workshop.

The Minister attended the evening session, where the PICSE students highlighted issues around the forum topic, "Investing in Youth in Agriculture".

National Director of PICSE, Associate Professor David Russell said PICSE was an integral part of the National landscape linking schools, universities and industry/research bodies.

"At this forum, PICSE used our national infrastructure to select previous industry placement students.

"They were flown to Canberra, where they used their experience to advise R&D Corporations how best to invest in youth for the future of agriculture.

"As a result of the partnership between PICSE and RIRDC, a large number of students have applied for this new studentship."

School-based trainees graduate

A pilot school-based traineeship program for indigenous students in the cotton industry culminated in a graduation ceremony in Newcastle last December which marked the start of new beginnings for the proud youngsters.

The Cotton Catchment Communities CRC in conjunction with CRDC and the Aboriginal Employment Strategy piloted the traineeship for the past two years. Three students, Chloe Pokarier-Baker, Narrabri, Bronwyn Scott, Wee Waa and Beau Quirk, Narrabri all praised the experience.

The AES school based traineeship program provides an opportunity for local indigenous students currently enrolled in Years 11 and 12 at Wee Waa and Narrabri High Schools to gain paid work experience, a nationally recognised qualification, credit towards their Higher School Certificate and exposure to the different career opportunities available in the cotton industry.

The students are required to undertake 800 hrs of work over the two years.

Chloe was employed at the CRDC offices in Narrabri, while Beau and Bronwyn were placed with the Australian Cotton Research Institute at Myall Vale.

CRDC Program Manager Helen Dugdale was on-hand to represent the cotton industry and the students' individual employers at the awards night, and said the pilot program had been hailed a great success by both employers and participants.

"All the trainees were enthusiastic about encouraging other eligible students to get involved and apply for a traineeship as they will gain confidence, engage in a great learning experience and get paid at the same time," Helen said.

"The pilot group has provided a learning curve for all concerned – the students, staff, schools, families and the AES.

"Hopefully other organisations in the region can see the benefits and will take on future trainees."

Helen said the three participants agreed their skills, experience and capacity had improved markedly while being exposed to range of vocations available through the cotton industry including business administration, research, IT and farm management.

"It is a possible source of future employees for agricultural organisations and businesses in regional areas," they said, adding "It breaks down the barriers between non-indigenous employees and indigenous students".

Further, the experience provided positive examples of workplace engagement to the trainee's family and the community.

Three new students will become part of the program this year, with Erika Anderson, Wee Waa High, working at CRDC studying Business Studies Cert II, Danielle Murray-Smith, Narrabri High, working at ACRI, studying Business Studies Cert II and Alex Trindall, Narrabri High, studying Rural Studies Cert II.

2009

Bronwyn

Beau

Chloe

2010

Danielle

Erika

Alex

High school student James Kirk will have his own project to research and develop with the help of researchers at the ACRI.

This new industry partnership has seen the first high school student taking part in the Student Industry Placement Program through PICSE, with The Armidale School's James Kirk from Moree.

James attended the industry camp which was held at University of New England.

The idea is for him to have his own project to research and develop with the help of researchers at the Narrabri Centre. His project is in the Entomology Cotton Research Area where he will be studying, sampling, analysing and recording information about the resistance to Bt Cotton between different refuge areas.

Cotton industry attracts young scientists

By Mary Ann Day

CRDC has co-opted support from the Cotton Catchment Communities CRC in a joint-investment with the University of Tasmania in a new initiative geared to attract top-notch science students to industry.

The joint investment over three years with the Primary Industry Centre for Science Education (PICSE), an initiative hosted by the University of Tasmania, the cotton industry can apply a proven formula known to participation of top students in agricultural science at universities.

CRDC interest to invest in human capacity building at the science student end came from study of national trends showing that the number of students studying science and agriculture at school and university is declining.

CRDC Human Capacity Program Manager, Rohan Boehm said future science capacity and investments that target this are vital for the industry's competitive advantage.

"It is very encouraging that other primary industry R&D corporations are also investing in PICSE. We now have a concerted effort to attract our best and brightest students to agriculture – it is what we have to do to remain globally competitive.

"CRDC was drawn to PICSE because it is an existing collaboration between universities, their regional communities and local primary industries. On our own, the cotton industry is not big enough to make an impact. What we are finding in 2010 is that joining forces with other primary industries in human capacity building is where our success is strongest.

"PICSE's indications in 2010 are extremely encouraging. Already in 2010, both the University of New England and University of Southern Queensland have an exciting surge of undergraduates enrolling in to their ag-science degree courses. This success is unprecedented for recent times given the much-publicised decline in ag-science enrolments.

"What is working is where PICSE directly encourages students to continue with school science and onto university science. The program intervenes by informing students and teachers about the diversity of exciting and rewarding science careers that are available in primary industries. PICSE supports science teachers with the relevant class activities, teaching resources and targeted professional learning.

"In 2010, the Cotton CRC and CRDC will turn our focus to directly encourage our agribusinesses and research institutions to view the PICSE success. It is an essential step now that we all ensure some of this new crop of ag-science students come to view cotton and irrigated agriculture as their future career choices, and that our employers respond by engaging directly with them as they make their employer choices."

The cotton industry initiative has engaged Cotton PICSE Education Science Officer, Trudy Staines to spearhead this quest.

"My role involves conducting student placements within cotton industry organisations, producing cotton-specific teaching resources and resources targeted at professional learning," Trudy explains.

"We will also be developing lasting relationships with pre-tertiary students and teachers, during classroom and out-of-school activities."

PICSE National Director, Associate Professor David Russell, is also very excited about the project and the level of engagement shown by the cotton industry through the involvement of CRDC and the Cotton CRC.

"By February 2010, there were eight Activity Centres spread across the nation," he said.

"The PICSE team now consists of thirteen Science Education Officers (SEOs) covering all States and seven National Hub staff. Currently we are under negotiations with additional universities and primary industry organisations to establish up to five new PICSE Activity Centres in 2010.

"In this expansion phase, PICSE is developing links with primary industries to establish Activity Centres that focus on regional specialties such as cotton, horticulture, seafood, forestry, ground water resources and natural resource management."

? For further information on opportunities in the cotton industry, contact Trudy Staines
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Ben Stephens, seated right at the ACGRA AGM at Warren in 2007, played a key role in guiding the ACGRA through the industry's 2008-13 Strategic R&D Plan in addition to his leadership of this key industry body leading up to and including its merger with Cotton Australia.

A career in medicine calls one of cotton's brightest

By Chrissy Brown

"Being a young person involved in the industry was an inspiring and invigorating experience. The cotton industry taught me a lot about the application of sound science and the principles to do what you feel is right."

After 12 years of progressive cotton production management with Auscott in the Namoi region together with a well-recognised and considerable contribution to development of the industry, one of its shining lights, Ben Stephens, is starting a new career in medicine.

And as he prepares to begin his studies in medicine in Canberra, Ben reflects on what the industry has given him and he given it in return, saying the "blending of science and practical knowledge is a potent mix for young people to gain exposure to all aspects of the industry".

"I am glad I had the opportunity to be involved as long as I did and believe it was a perfect grounding for what I would like to do for the rest of my life," he said.

"Being a young person involved in the industry was an inspiring and invigorating experience. The cotton industry taught me a lot about the application of sound science and the principles to do what you feel is right.

"The acceptance of who you are and, if you were willing to have a go, the opportunities which were available to you at all levels makes the cotton industry unique within Australian agriculture.

"Being involved with the cotton industry and pretty much agriculture in general has also given me a love for rural Australia. I will take this with me into the future and will always be a strong advocate for those people who choose to live and work in the bush."

Ben's career began in the industry bug checking at St George during the 1996/7 season. This was at the time when transgenic cotton varieties were being introduced to Australian production.

Ben spent the next 12 years with Auscott, starting as an agronomist. This was followed by his appointment as farm manager of the Auscott Namoi Valley Farming Operations in 2003.

As an agronomist, Ben's involvement with industry associations started with the Lower Namoi Cotton Grower Association, in various roles including treasurer and chairman up to the day he left the industry.

He furthered his industry contribution by joining the Australian Cotton Growers Research Association (ACGRA) in 2004 where he represented Auscott.

A year later he became a member of the ACGRA executive, then vice chairman and finally had the distinction of being the last ACGRA chairman prior to the merger with Cotton Australia, at which point he then became a member of the Cotton Australia Board.

Ben also accepted the challenging role of chairman of the 14th Australian Cotton Conference held at the Gold Coast in 2008.

Enabling a scientific approach to cotton production has been the cotton industry's core research and development investments, Ben says.

"I have always been able to implement the latest science and farming techniques whether that be crop nutrition or watering strategies. For

Ben played a key role in the successful running of the 2008 Australian Cotton Conference is seated next to ACSA's Tracey Byrne-Morrison, and with Cleve Rogan, Guy Roth, Brian O'Connell, Greenmount Press, and Pete Johnson, Chair of ACSA.

Ben says that in many ways 2008 stands out as a most memorable year as it included "Battling the drought while growing record yields; chairing ACGRA in a conference year; completing the merger between the two industry conferences with Australian Cotton Shippers Association and ACGRA, and finally the process of working through the successful merger of ACGRA and Cotton Australia."

us, going forward has always been based on the current science and latest R&D," he said.

"The opportunity to farm at a level with Auscott that few people would ever experience is truly a highlight.

"We completely changed the irrigation technique and style of every single field based on the R&D that was coming to light during the 10 year period that I was there. We laser leveled all the fields, changed the head ditch designs, flow rates, drainage, a lot of that was for farm irrigation optimisation.

There were many other R&D outcomes that he says they implemented such as soil health strategies, IPM, crop rotations, and many other components of the whole package in cotton production.

Over his 12 years in the industry, Ben says that insect management would be one of the most significant developments that impacted his production management at Auscott in the Namoi Valley.

"One of the most significant developments is the contrast in insect management now from when I first started when agronomy and insect management was all about sampling and counting insects and scheduling sprays.

"Now, through the combination of IPM, transgenic varieties starting with Ingard then Bollgard, and BMP, we have dramatically changed our approach and this has freed us up to manage other things like water and nutrition."

Ben believes the greatest challenge to the industry now is maintaining its capacity through these periods of short water supply.

He said from an R&D angle, the challenge will be to find ways to do more with less resources and explains it is why he was such a large supporter of the ACGRA–Cotton Australia merger where the purpose was to do more with less.

During his time working in the cotton industry Ben realised the power of working together as a single cohesive unit.

"The cotton industry is unique in its ability to work together, effectively communicate to all of its members and it is not afraid to address its critics. This is all possible due to the ability of the people in the industry to work together and share a common goal," he said.

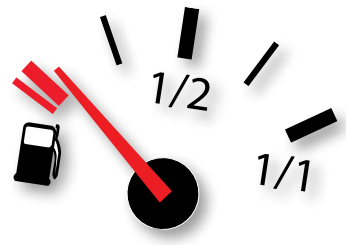
"I learned that everyone has a role to play and that everyone participates at the different levels that they feel comfortable with. I enjoyed working with the people in the industry and realised early that you could make a difference, either individually, as a group or as an industry, if you wanted."

Ben adds that he also come to understand the power of leadership, and what roles leaders at all levels have to play in the success of the cotton industry.

For someone whose career has included winning the Cotton Grower of the Year in 2006 and the Young Achiever of the Year in 2009, his new challenge is sure to be a success.

On-farm energy - it is unlikely we will have a bio-fuel industry large enough to cater for a potential rapid decline in diesel fuel supplies.

Is Peak Oil a looming threat?



Like most sectors of our economy, the agricultural sector is very dependent on fossil fuels to meet energy and fertiliser needs.

Bruce Pyke,
General Manager
R&D Investment CRDC

Debate around Peak Oil (when world production can no longer meet demand) has moved from "if" to "when" this will occur.

Some of the more pessimistic analysts and commentators (eg Michael Lardelli – see link http://www.onlineopinion.com.au/author.asp?id=4679) suggest that we may have already reached Peak Oil in 2007 or 2008 (and that the GFC has masked its impact). Others (eg UK Energy Research Centre – see link http://www.ukerc.ac.uk/support/tiki-index.php?page=Global+Oil+Depletion) believe Peak Oil will occur before 2030, and possibly before 2020.

CSIRO modelling in 2008 (In: "Fuel for thought – The Future of transport fuels: challenges and opportunities"–see link http://www.csiro.au/resources/Fuel-For-Thought-Report.html) show the possible impact on the Australian transport sector of a Peak Oil event by modelling both slow and rapid responses in the establishment of alternative energy sources – a rapid decline in oil supply coupled with a slow response would create significant socio-economic upheaval.

Just in terms of the impacts on liquid petroleum fuel prices, the CSIRO estimates that:

- A rapid response to a peak event that had a slow decline in oil supplies could lead to fuel prices increasing to around $2-$3 per litre.
- A slow response to a peak event that had a rapid decline in oil supplies could very rapidly lead to fuel prices of up to $8 per litre
- In contrast, a carbon price of up to $100 per ton CO2-e would increase prices by only about $0.25 per litre.

In addition, Australia's imports of liquid petroleum fuels are increasing as production in our local oil fields declines and by 2020 production in our major existing fields will effectively decline to zero.

With these points in mind, how well positioned are our agricultural industries to maintain production in response to a future likely to see declining oil supplies and increasing prices?

While there is considerable R&D currently underway on the development of bio-fuels, it is unlikely we will have a bio-fuel industry large enough to cater for a potential rapid decline in diesel fuel supplies. The question arises as to what other alternatives could we use as an interim measure until bio-fuel supply increased? Do Australia's abundant supplies of LPG and CSG offer an interim solution to the risk of a diesel shortage?

CRDC is seeking interest in working with the cotton and other rural industries to help prepare for these challenges.

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