COTTON RESEARCH & DEVELOPMENT CORPORATION

Spotlight on Cotton R&D

AUTUMN 2013

HARVEST & BEYOND: PROTECTING OUR FIBRE & GENE TECHNOLOGY

Best Practice

IMAGE ROHAN BOEHM

Leading CSIRO researcher Dr Rose Brodrick (right) discussing plant physiology at ACRI with industry's newly appointed Regional Development Officers Alice Devlin and Sally Dickinson.

IN THE SPOTLIGHT

The capacity to engage with growers in the delivery and use of research results has been strengthened with the appointment of new regional support staff. This is great news for growers and the industry. The appointments are representative of the collective commitment of CRDC, Cotton Australia and Cotton Seed Distributors to resourcing and managing the industry's Development and Delivery (D&D) Program. Growers and consultants are encouraged to call upon their Regional Development Officers (RDO) for support including the latest research and best management practice information or other issues that researcher and technical specialists can address. In this issue of *Spotlight* we have asked the technical specialists within the D&D Program to focus on the key stewardship and fibre quality issues that arise at harvest time.

The Resistance Management Plan (RMP) for Bollgard II outlines how a crop needs to be managed post-harvest. Making sure these technologies continue to work well is in everyone's interest. We have provided information on how to best manage crop residue and why the tried and tested pupae busting is so important to the future of our Bt technology.

Outbreaks of mealybugs, cotton bunchy top and nematodes are stark reminders of constant threats to our industry. It is through good farm hygiene, in particular removing weeds, volunteer and ratoon cotton from around farms, as well as observing the Come clean. Go clean. message that these outbreaks can be contained and avoided in the future.

Growers have overcome serious challenges from pests and diseases in the past through supporting whole-of-industry approaches. The specifics of those challenges may have changed but you don't have to ask too many questions of experienced growers to know the risks remain very real. In summary everyone has a role to play and responsibility to each other in making sure the industry prospers into the future.

Management of the harvest is as critical as the efforts that go into the growing phase. Industry has invested much in the way of research to quantify and outline the best management practices in preparing and harvesting cotton crops. We encourage growers, farm managers and consultants to use the resources available through *my*BMP, including the new Harvest BMP, *Australian Cotton Production Manual* and *FibrePAK* in particular which outline the most suitable ways to a clean, low moisture, high quality product for delivery to gins. We have provided a snapshot of this research that can help growers get the most from their crop and in the process protect Australia's reputation for high quality cotton.

The safety of people at harvest is also paramount. Harvest comes with its own unique hazards and risks, which need to be identified at inductions for all people coming onto farms. CRDC produced a Cotton Harvest Safety DVD after the advent of the round-module picker as a resource for growers and contractors to use as an induction tool, which is now available on the web. In recommending this resource I wish everyone involved a safe and successful harvest.

The labour market has thrown up some challenges for primary industry and the cotton industry has been working to understand our workforce – or lack of it – and how it can be attracted and sustained. CRDC commissioned a study last year into the industry's workforces including in-depth studies into the Emerald region and Gwydir Valley. We have included the initial findings from the Gwydir research here, with hopes further meetings at Moree this month provide the information needed by industry to formulate action plans to ensure a healthy, sustainable labour source.

On a positive note it always a pleasure to report on the difference CRDC investment can make to people in their development. By example CRDC and other industry bodies continue to invest in tertiary students to encourage them into futures in our industry. A pilot project with indigenous student Shane Toomey and the Horizon Scholarship for university student Billy Browning are featured.

In closing I hope that throughout this issue of *Spotlight* you can see clear evidence that the quality, capacity and commitment of the people involved in all aspects of the industry remains central to its success.

Bruce Finney

Australian Government
Cotton Research and Development Corporation

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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, Joe Ludwig. 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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THE INDUSTRY'S ABILITY TO PROVIDE SUPPORT AND INFORMATION TO GROWERS HAS BEEN BOLSTERED WITH THE APPOINTMENT OF SIX NEW PEOPLE TO MAJOR GROWING REGIONS.

DELIVERING R&D TO GROWERS

CRDC, Cotton Seed Distributors and Cotton Australia entered into a joint venture in the national Cotton Industry Development and Delivery (D&D) Program last year to provide support for the effective delivery of research to the industry that supports improved practices, R&D communications and responsiveness to emerging or emergency issues.

This included the bringing together of a Cotton Industry D&D Team of technical specialists, most of whom had existing roles in the industry with various research or industry organisations and with various fields of expertise.

Dr Ian Taylor, who is well known throughout the industry for his past roles in research and development, was chosen to lead this D&D Program.

The latest development in the resourcing of the program is the appointment of Regional Development Officers (RDOs), who as the title suggests, have been appointed to the each of the major cotton growing valleys.

Operating under the 'CottonInfo' banner, the officers, John Smith (Darling Downs), Sally Dickinson (Gwydir), Alice Devlin (Border Rivers), Amanda Thomas (Macquarie), Kieran O'Keeffe (Southern NSW), Geoff Hunter (Namoi, Bourke, Central Queensland) and Kirrily Blomfield, (Upper Namoi), underwent an induction and familiarisation tour in early February before taking up their positions.

The D&D Program is a partnership for the industry with a long term commitment that will include critical reviews every five years to ensure the venture is meeting industry needs. This partnership represents a significant financial commitment by the three organisations of up to $17 million over the five-year period.

Another key element of information delivery is the *my*BMP website which is currently being transformed as the primary information delivery platform for research information to the industry.

"While *my*BMP is already an excellent information source, we are enhancing its capability for information delivery as well as building linkages to other sites so growers and advisors are better supported in their information needs," Ian said.

IMAGE JOSH SMITH

New areas have been added to the site including *my*INFO and *my*TEAM through which growers will have access to the latest research information and also have direct contact with the new RDOs through blogs or e-mail.

An e-newsletter has been developed by Ian and the team to be sent to growers which outlines the latest research findings relevant to the particular cotton cropping phase and to address key emerging issues.

The RDOs will work closely with the existing D&D Team of technical specialists along with Cotton Australia's Regional Managers and CSD's Extension and Development team.

"The services offered by RDOs are fully complementary to growers' existing information and knowledge services provided by agribusiness, agronomy consultants, state and federal departments," Ian said.

"Most importantly as partners with a number of organisations these regional team members seek to leverage and extend the reach of cotton research and development to better meet grower needs.

"The RDOs will provide direct services to growers where this is not already met in the marketplace and in taking this direction, will seek to streamline information delivery, not duplicate existing services."

As part of the comprehensive induction tour, the RDOs met with technical specialists from the D&D Team and leading researchers at ACRI, where they gained a full appreciation of what is involved in cotton research, from soil health to climate research, plant breeding and pathology.

"This gave the RDOs a chance to meet the researchers and vice versa, and to gain an appreciation of how the industry works and how the information flows," Ian said.

"The induction also included some really good information from Greg Kauter at Cotton Australia and Philip Armytage at CSD on the roles of the various industry bodies, their responsibilities and focus.

"A visit to CSD's operation at Wee Waa showcased the seed breeding side of cotton production and gave the opportunity to meet some of the CSD extension and agronomy team.

"It was a three-day induction aimed at giving the broadest possible overview of the industry and allow the RDOs to meet and network with people involved at various levels of industry they will be working with.

"This will provide the best information pathway between research and growers and just as importantly, growers to researchers and our D&D technical specialists."

Ian Taylor
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email us

At the Regional Development Officers' three-day induction into the workings of the cotton industry were CSD's Manager Development and Communications Philip Armytage, Regional Development Officers Kieran O'Keeffe, Geoff Hunter, Amanda Thomas, Alice Devlin, Sally Dickinson, John Smith, Cotton Australia's Greg Kauter and Development and Delivery Program Manager Ian Taylor.

John Smith: Darling Downs

John was formerly District Agronomist at Barham with NSW DPI, and has extensive domestic and international experience in both dryland and irrigated farming systems.
For the best part of two decades, John has specialised in agronomic activities as a technical officer with NSW DPI, and as an agronomist specialising in winter crops and rice.
He has a Bachelor of Applied Science (Agriculture) and has a Masters in Agricultural Science. He has worked as a facilitator with producer, industry and agribusiness groups both in Australia and Asia, using a range of multi-media formats and conduits, and is familiar with pests, weeds and diseases common in the cotton industry.
He is a strong advocate of hands-on extension activities including local trials, field days, farm walks, workshops, meetings and conferences, supported by surveys, monitoring, evaluation and feedback.
His involvement with climate change issues and the adoption of best management practices are further assets that will benefit the Darling Downs cotton industry.
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Amanda Thomas: Macquarie

The cotton industry in the Macquarie region has access to a new Regional Development Officer, Amanda Thomas. She has been a cotton grower at Warren for the past five years and has also worked as an agronomist and a workplace safety officer with Auscott at Warren, heavily involved in education, training, monitoring and evaluation.
Her background in cotton agronomy includes the use of geographic information systems (GIS) and analysing maps showing precision agricultural data, such as crop yields, soil characteristics, input applications, drainage patterns, and field management history; and in developing whole farm plans.
She has extensive experience in implementing BMP practices and facilitating BMP audits; managing trials; preparing annual gross margins and crop budgets; and complying with and creating OH&S protocols and procedures to adhere to NSCA 5 star Audits.
Her academic qualifications include a Bachelor of Applied Science (Agriculture) at Charles Sturt University, Wagga.
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Alice Devlin: Border Rivers

A former Catchment Officer with the Border Rivers-Gwydir Catchment Management Authority, Alice played an important role in advising and guiding growers on native vegetation policies and legislation, and in negotiating successful social, economic and environmental outcomes.
While working with the Border Rivers-Gwydir CMA, she developed and implemented a comprehensive property vegetation extension and communications plan to deliver increased knowledge and skills to landholders.
She has extensive experience in sponsoring liaison between community, commercial and government agencies in the area of natural resource management, including Landcare.
Her background experience also includes capturing, maintaining and analysing GPS data for the preparation of major map databases for a global leader in digital mapping.
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Kieran O'Keeffe: Southern NSW

Kieran O'Keeffe has spent the past decade as NSW DPI agronomist at Coleambally, has been appointed to the new position in the Murrumbidgee region. In his role as a district agronomist, he has worked closely with irrigators in the Murrumbidgee valley providing advice on a range of crops including cotton, rice, maize, soybeans, wheat, barley and pulse crops, and organising discussion groups, regional field days and variety trials. He was awarded a cotton production course scholarship through University of New England, completing the first two modules of the Graduate Certificate in Cotton Production, achieving a high distinction in Cotton Production and a distinction in Cotton Pest management.
His other involvement in cotton includes organisation of the Griffith Cotton Expo; conducting thin polymer film demonstrations on cotton establishment; spray drift management workshops; and IPM in cotton workshop for Riverina advisors using Skype technology.
He has also conducted herbicide resistance workshops; organised carbon trading and climate change workshops; and delivered conference presentations on soil moisture monitoring and water use efficiency.
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Geoff Hunter: Namoi/Bourke/ Central Queensland

Geoff Hunter has taken up the new position of Research Development Officer for the cotton industry in the Namoi, Bourke and Central Queensland regions.
He holds a Bachelor Degree in Agribusiness and has spent the past 10 years in a range of management roles in cotton, grain and livestock associated enterprises, capitalising on his background in budgeting, accounting, marketing, relationship building and new product development.
He is best known for his role as Regional Manager for Cotton Australia responsible for informing cotton growers and establishing information flows and maintaining internal and external liaison in northern NSW.
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Sally Dickinson: Gwydir

Sally Dickinson, formerly Regional Landcare Facilitator at Moree for the the Gwydir Valley Irrigators Association Inc. has been appointed the new Regional Development Officer for the Gwydir region. Sally also will be providing support and mentoring for all CottonInfo Regional Development Officers.
Since the mid-1990s, Sally has been facilitating community, grower, industry and government groups to achieve beneficial change for individuals, communities, industry and organisations at both the individual on-farm and strategic industry levels.
In her previous position, she played an active role in facilitating and delivering research via *my*BMP and other extension methods, including area wide management networks, supported by the Gwydir Valley Irrigators' Association.
Her information facilitation and extension activities have included liaison with key industry researchers involved in problem solving relating to silver leaf whitefly, aphids and beneficial insects, and in organising flood recovery and national resource management forums.
Sally has also been active in the Sustainable Cotton Landscapes project managed by the CRDC; in facilitating the provision of ecosystem services; nutrient management; field days; farm walks; explaining the Carbon Farming Initiative; and in facilitating and fostering the role women play in the cotton industry via her role as a Wincott committee member.
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Kirrily Blomfield: Upper Namoi

The sharing of real life, on ground grower experiences is something Kirrily Blomfield is helping to facilitate as part of her Network Development Officer role with the Upper Namoi Cotton Growers' Association and AgVance Farming. Kirrily's position encompasses the traditional extension role responsibilities such as spreading the findings of the latest research to growers and ground truthing these findings, in which her agronomic background is advantageous. The partnership between the two groups has helped to maximise the benefits of this interaction, as the AgVance Farming group of growers is familiar and comfortable with the model of openly sharing their successes and failures, which flows on to encourage others to do likewise and the result is lots of practical, relevant learning.
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INDUSTRY TEAM COMING TOGETHER AT MOREE TRADE SHOW

CRDC IS ENCOURAGING ALL GROWERS AND CONSULTANTS TO COME AND MEET THEIR NEW D&D TEAM.

Growers and farm managers will have the opportunity to catch up face to face with the Cotton Industry Development and Delivery (D&D) Team of Technical Specialists and Regional Development Officers at the Australian Cotton Trade Show in Moree from May 29 to 30.

Organisers are expecting more than 150 industry specific exhibitors and 800 growers and their staff from across all growing areas to be on site over the two days of the trade show.

Since the inception of the D&D Program – a joint venture between CRDC, Cotton Seed Distributors and Cotton Australia, D&D Technical Specialists, led by Dr Ian Taylor and along with industry researchers have been developing new information campaigns linked to new information delivery technologies to assist the team.

Work is underway in high priorities areas that directly underpin farm profitability such as water use efficiency, nitrogen use efficiency, energy efficiency and pest, weed and disease management. It is this work that will be showcased at the Cotton Trade Show in May.

The D&D Team will have a significant presence on the ground and will also be coordinating the Industry Forums at the event.

"It will be a two-way street," Ian said.

"We will be looking to update growers with the latest information we have in the high priority areas. We will also be looking for feed-back from growers.

"While a lot of our information is relevant to all growers in the industry we are also well aware that there are often subtle differences peculiar to a particular region or a particular farming system.

"We need to be speaking and working with growers so we appreciate and better understand these nuances."

To assist with delivery side of their work the D&D team is working on a number of 'apps' for mobile devices such as your smart phone or an iPad.

"These include crop diseases and symptoms and a 'whole of industry' calendar. We will be looking to both promote these at the event and to again seek grower feedback," Ian says.

D&D PROGRAM TECHNICAL SPECIALISTS

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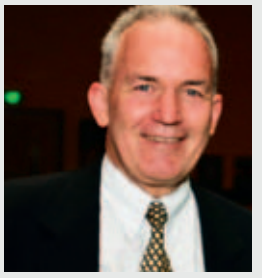

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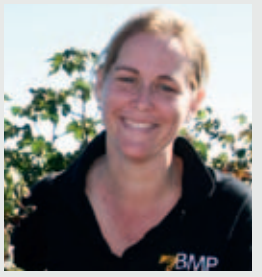

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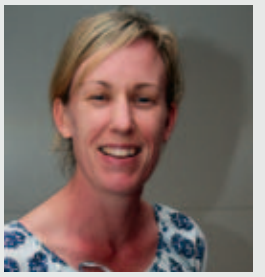

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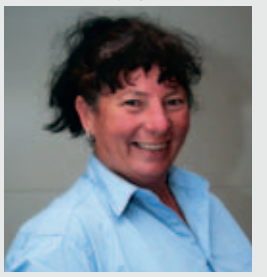

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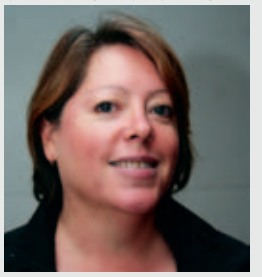

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MAJOR HARVEST ISSUES IDENTIFIED

NOT GETTING DEFOLIATION RIGHT HAS FLOW ON EFFECTS RIGHT DOWN THE LINE, FROM INCREASING COSTS AND REDUCING PROFITS TO GROWERS TO POOR FIBRE QUALITY WHICH AFFECTS AUSTRALIA'S REPUTATION AS PRODUCING SOME OF THE WORLD'S BEST COTTON.

Australian Cotton Ginners Association President Andrew Vanderstok and ACSA Board Member Phil Sloan and at the recent Field to Fabric Roadshow in Moree, which gave valuable information about cause and effect in relation to crop management and the final product.

Spotlight's Melanie Jenson caught up with ACSA Board Member Phil Sloan and Australian Cotton Ginners Association President Andrew Vanderstok at the recent Field to Fabric Roadshow in Moree to talk about what they saw as important issues in the lead up to and during harvest.

"Defoliation and moisture" was the almost in-unison reply from both men.

In this article we look in particular at defoliation. (See article *Managing Moisture* Page 9.)

The results – or problems – caused by poor defoliation are felt right along the production chain once the cotton leaves the farm, but are first encountered by ginners. Poor defoliation means more trash in the lint, and that equals more intense ginning, but they can only remove so much.

"Defoliation, if done correctly means low trash; if done incorrectly means higher trash content; therefore growers should follow guidelines for best practice defoliation," Andrew said.

"There are other factors which may increase trash content, such as pickers not set up or working correctly and picking when moisture is too high, as this affects the efficiency of the machine to cleanly take the cotton from the bush."

High trash content does not only offer a contamination issue, it has fibre quality implications as well.

"High trash content in seeded cotton delivered to the cotton gin will require more cleaning equipment and possibly the attention of more heat from the burners to reduce the amount of trash contained in the bale sample.

"An increase use of ginning equipment will result in a higher count of neps that can be found within the fibre.

"Higher volumes of trash will reduce the turn out percentage from the module and give less return to the grower; also this adversely has an impact on gin through-put and results in a higher running cost."

Contamination and neps are the main concern in Australian cotton, according to our customers, the mills and spinners. Neps affect the appearance of cotton yarns and fabric and are usually associated with lower yarn strength, poorer spinning performance and a more irregular yarn. There are no cost-effective means of covering or removing them once they are in the fabric. They appear as spots or 'flecks' on finished fabrics and this downgrades the fabric or it is rejected.

Merchants feel the effect of handling all forms of contamination in cotton, but this effect can be lessened and it starts with good defoliation practices.

"Our customers want zero contamination," Phil Sloan said.

"They want contamination-free and low neps.

"The place to start to addressing contamination issues is defoliation because poor defoliation has such a knock-on effect on the quality and profitability of the harvest, which is felt strongly down the value chain.

"The bottom line is if it's easier to pick, it's easier to gin and easier to market.

"Dry weather at defoliation and harvest is the key to a good defoliation and pick."

"THE PLACE TO START TO ADDRESSING CONTAMINATION ISSUES IS AT DEFOLIATION."

MAJOR POINTS AT HARVEST

- Best practice defoliation, picking and module building.
- Don't pick too early
- Moisture levels need to be monitored
- Stage round modules in picking order
- Prevent contamination
- Notify ginning companies of any known abnormalities

DEFOLIATION: GET IT RIGHT FOR BETTER QUALITY AND BETTER RETURNS

AN EFFECTIVE DEFOLIATION MEANS SEED COTTON WITH LESS LEAF AND TRASH, WHICH ULTIMATELY HELPS PROTECTS THE INTEGRITY OF FIBRE QUALITY.

A poor defoliation creates issues at harvest – and they don't stop there – these issues are passed down the line and have negative effects for ginners, marketers and ultimately, our customers the mills and spinners.

The Australian cotton industry has invested many resources to better understand the defoliation process and formulate guidelines for best practice.

Timing applications for effectiveness

Use of defoliants allows timely and efficient harvest of the lint to reduce quality losses from weathering and leaf stain from excess leaf trash.

Boll opening is accelerated by defoliation as removal of leaves exposes bolls to more direct sunlight, promoting increased temperatures for maturation, and drying and cracking of the boll walls.

Application of defoliations earlier than 60 percent of bolls open will reduce micronaire and increase neps. In crops that have non-uniform maturity it is advisable that there be no more than 29 percent immature bolls (of total boll number) that are defined as immature bolls using the boll cutting technique to avoid increasing neps.

Types of harvest aids

The categories of harvest-aid chemicals include herbicidal and hormonal defoliants, boll openers, and desiccants, each with a different mode of action.

Defoliants

(Thidiazuron, Diuron, Dimethipin)

All defoliants have a common mode of action to remove leaves.

Boll openers/conditioners

(Ethephon, Cyclanillide, Aminomthanane Dihydrogen Textraoxosulfate)

These chemicals specifically enhance ethylene production by providing a chemical precursor for the production of ethylene, which leads to quicker separation of boll walls (carpels).

Desiccants and herbicides

(Sodium Chlorate, Magnesium Chlorate, Glyphosate, Diquat, Paraquat)

Desiccants should be avoided as they dry all plant parts (including stems) which can increase the trash content of harvested lint. Sometimes however, it is necessary to use desiccants if conditions do not enable the effective use of defoliants (eg very cold weather). Desiccants are also a reliable method to reduce leaf regrowth. High rates of some defoliants can act as desiccants.

Monitoring maturity

To determine crop maturity monitor plants that are representative of the crop. Methods include:

- **Percentage bolls open –** Crops can be safely defoliated after 60-65 percentage of the bolls are open. This method is simple and works well in crops with regular distribution of fruit.
- **NACB (Nodes above cracked boll) –** In most situations four NACB equates to the time when the crop has 60 percent bolls open. This is a useful methodology on crops that are uniform in growth, and is less time consuming than percentage open bolls.
- **Boll cutting –** The easiest and probably the most effective method to determine if bolls are mature or immature. It can be used effectively even when crops are not uniform (eg tipped out plant, gappy stands).

Bolls are mature when: they become difficult to cut with a knife; the seed is well developed (not gelatinous) and the seed coat has turned brown; and when the fibre is pulled from the boll it is stringy (moist but not watery).

An extended version of this article can be found at www.*my*BMP.com.au

APPLICATION POINTERS

- Low humidity during application decreases uptake because chemicals dry rapidly on the leaf.
- For penetration of defoliants lower into the canopy consider using larger droplet size or directed sprays in the case of ground rig use. Use of spray adjuvants may decrease droplet sizes and this may work against chemical penetrating deeper into the canopy.
- Many growers use combinations of defoliants with different modes of action and multiple applications to enhance defoliation. Multiple applications are beneficial because leaves deep in the canopy can be covered fully.
- If increased waxiness of the leaves is suspected, applying the defoliant in warmer conditions can assist chemical penetration as the waxy layer is more pliable.

Further Resources

*my*BMP www.*my*bmp.com.au

Australian Cotton production Manual pages 120 -125 or
http://tinyurl.com/8mrz6sc
http://tinyurl.com/bgnb4zk

FIBREpak Chapter 11
http://tinyurl.com/b4gqpj2

www.cottassist.cottoncrc.org.au
The last effective flower tool on the CottASSIST website which can be used to identify the timing of first frost for your locality –

Cotton Pest Management Guide and manufacturers details for specific chemical defoliation options and rates or
http://tinyurl.com/bjeaxzv

Weather services

www.dpi.qld.gov.au/rainman/
www.bom.gov.au/climate/averages/

see our website

WHEN COVERAGE IS KING

SPRAY APPLICATION EXPERT BILL GORDON TELLS HOW TO BEST APPLY DEFOLIANTS TO GET THE OPTIMAL RESULTS FROM THIS CRITICAL OPERATION.

When it comes to effectiveness of defoliation coverage is king, yet can often be compromised as a fully mature cotton plant can have a large leaf area, with each layer of leaves capable of intercepting a percentage of the incoming droplets. As the upper leaves intercept droplets, they reduce the number of droplets that are available to deposit onto the leaves that are situated in lower parts of the canopy.

Typically the leaves in the upper third of a mature cotton plant will intercept around 70 percent (or more) of the incoming droplets. This means that when we are trying to defoliate the crop, good coverage becomes a function of droplet size (for penetration, retention and survival) and the application volume (which dictates the number of droplets produced).

Best practice is about doing all the little things well, which add up to a better outcome. For defoliation this means maximising the deposition on the crop and minimising the off target movement and ensuring the products are used in accordance with the manufacturer's recommendations and following all of the label instructions and restraints.

GROUND APPLICATION

Over the top

For ground application, higher water rates (typically above 100 L/sprayed ha) usually provide superior results. Higher water rates often remove more leaf per application.

Fine spray qualities tend not to penetrate beyond the upper third of the canopy.

Medium spray qualities balance penetration and droplet retention but still present a risk for off target movement of product. Coarse spray qualities increase droplet penetration and reduce drift potential, but can also reduce the evenness of application due to the reduction in droplets numbers

There is roughly a five-fold difference in the number of droplets produced when comparing the medium end of a fine spray quality with the medium end of a coarse spray quality. Hence, using larger droplets (to minimise drift) generally requires higher application volumes to produce a sufficient number of droplets.

Droppers and directed sprays

If droppers are used to release the spray within the canopy, the use of fine/medium droplets will generally provide the best coverage.

Hence for ground application, a good setup for defoliation is to have nozzles producing a medium/coarse spray quality over the top of the row (often using twinjet style nozzles or twin caps), and a number nozzles on droppers/swivels releasing medium/fine droplets in the canopy.

AERIAL APPLICATION

Most agricultural aircraft do not have the ability to economically spray at the volumes that a ground rig is capable of. Most aerial defoliations occur at volumes up to 40-50 L/ha.

Often the smaller droplet sizes used, combined with the higher release heights they operate at, means that the risk of spray drift moving off target is far greater with an aircraft than using a ground rig under similar conditions.

It is always good practice to discuss the application with the aerial operator, ensuring they are aware of sensitive areas, potential hazards and that you are both understand label restraints on how the products may be used.

Label changes and no fly zones

Australian Pesticides and Veterinary Medicines Authority's (APVMA) changes to labels have occurred on new and recently reviewed products (such as those containing Diuron).

One of the significant changes is the inclusion of no spray zones – an area that cannot be sprayed when the wind is towards an area considered to be sensitive on the label. One example with a no spray zone is Dropp UltraMAX.

Suitable conditions

Favourable weather conditions are critical to minimise the potential for damage to native vegetation, aquatic areas and other crops.

- To ensure even application the wind speed and direction should be reasonably consistent and away from sensitive areas.
- Avoid surface temperature inversions – Night spraying includes the whole period between sunset and sunrise. To spray at night the wind speed should remain above 11 km/h for the entire period In plain terms, if the wind speed drops late in the afternoon, an inversion is most likely forming and the risk for spraying herbicides or defoliants is too high.
- Temperature and humidity, wind speed and direction must be measured and recorded at the site of application.
- It is good practice not to spray when the delta T value is below two, or exceeds 10 for medium droplets and 12 for coarse droplets as measured at the target site.

Keep good records of the whole application

Measuring and recording the weather conditions must occur at the site at the start, during and completion of the application. Many labels now specify the type of records that must be kept. These must be read in conjunction with state regulations, such as the NSW Pesticide Act or the Qld ACDC Act. Good records include a comment on the outcome of each spray job and noting the results.

To read this article in full with more tips from Bill, go to www.*my*BMP.com.au

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Moisture levels in cotton can rise sharply at dusk and moisture should be monitored very regularly.

MOISTURE MANAGEMENT A MUST

HIGH SEED COTTON MOISTURE LEVELS CAN REDUCE THE 'GINABILITY' OF SEED COTTON, ARE DIRECTLY LINKED TO LOWER COLOUR GRADES AND CAN COST GROWERS HUNDREDS OF DOLLARS PER HECTARE IN DISCOUNTS. EXCESSIVE DRYING CAUSES FIBRE DAMAGE AND HIGH SEED COTTON MOISTURE IS OFTEN ASSOCIATED WITH HIGH TRASH CONTENT.

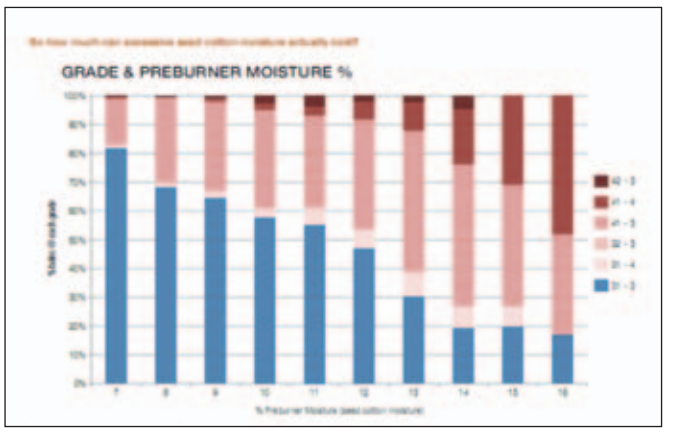
Higher moisture levels are directly linked to lower colour grades and can also mean that excessive drying is needed which causes fibre damage. High seed cotton moisture is also often associated with high trash content.

In general the Cotton Ginners Association considers seed cotton moisture levels between six percent and 10 percent as ideal, 11 to12 percent as marginal and above 12 percent as excessive. Given an extended storage timeframe in the field or gin yard the lower the seed cotton moisture the better results the grower will receive from his farm.

Picking cotton with high moisture can also result in poor performance and damage of machinery or timely delays.

Cotton picked wet will result in lint becoming twisted on the spindle of the harvester which may lead to seed cotton being more difficult to process in the gin. The harvesting operation itself is also interrupted as picker doors are blocked more often when cotton is too moist and efficiency declines as a result of poor doffing efficiency. Doffers and moisture pads on pickers can also be damaged.

Those who see first-hand the effects of high moisture on fibre are the people past the farm gate.



This graph represents approximately 13,000 bales processed at a single site for the 2011 season. Each column represents the proportion of bales by grade at each moisture percentage. Although moisture content is not the only determinant of colour and leaf grade it is clear that high moisture content can have an additional negative impact on fibre quality.
Assuming no other penalties (i.e. base micronaire and staple) the average discount for bales from modules below 12 percent moisture was $15/bale and above 12 percent was $33/bale. Given the industry average yield for irrigation cotton from the 2010-2011 season of 9.7 bales/ha this represents an average discount cost of $320 per hectare for seed cotton moisture content equal or greater than 12 percent. Courtesy Andrew Vanderstok Namoi Cotton.

The issue of moisture is most often viewed in terms of its effect on fibre quality and thus marketability. However the issue can also hit growers squarely in the hip pocket, according to figures presented by Andrew at the Field to Fabric. These figures showed the average discount costs can total $320 per hectare for seed cotton moisture content equal or greater than 12 percent (Table 1).

Fibre quality is integral to the success and sustainability of Australian cotton. Harvesting crops to produce seed cotton with high moisture can undo a lot of good management undertaken during the growing season.

SHOULD WE BE HARVESTING?

MOISTURE CONSIDERATIONS:

- There is no dew present and relative humidity of the air should be less than 70 percent. If moisture is present on vehicles while harvesting it is most likely that the cotton is too wet.
- The seed should feel hard (cracks in your teeth).
- If you can feel moisture on the cotton it is too wet. Seed cotton measured on a moisture meter should be between six and 10 percent and no greater than 12 percent.
- Consider that machine picking can also add two percent moisture to seed cotton.
- A symptom of moist cotton is frequent blocked doors which causes the picker to throw cotton out the front of the picking heads.
- If cotton is being expelled into the basket in dense blobs and is not fluffy it may be too moist.
- Suitable picking conditions late into the night are rare.

ABOVE: Moisture levels in cotton can rise sharply at dusk and moisture should be monitored very regularly.

ABOVE: Staging and delivering modules correctly aids the ginning process and allows ginners to provide better feedback to growers.

"If you make the decision to pick wet cotton be sure to understand that the quality may not be the same," Australian Cotton Shippers' Board Member Phil Sloan says.

"However, if you make a decision to pick when moisture is high, make sure this information is conveyed to the gin so they can deal with it appropriately.

"Picking wet cotton is something that in 99 percent of situations can be avoided, so planning and good management is the key.

"All of industry understands the need to get the crop off in good time, but sacrificing quality for high moisture levels affects the industry at every level.

"Our overseas customers value us for our ability to consistently produce high quality cotton, so from a merchant's point of view it is vital we manage our harvest according to the research that has shown the effects of high moisture on fibre quality."

Wet cotton processed into a module in the field will also increase the risk of the module self-combusting or lowering the grade due to yellowing or spotting associated with fungal contamination.

High moisture content is usually caused from picking in unsuitable conditions, or modules/round bales exposed to moisture while in storage or in the field. Good harvest management is the cornerstone in avoiding high moisture and a clean, high quality harvest by monitoring weather conditions.

Moisture and weather play

Moisture monitoring needs to be more frequent at the beginning and end of each day as the change in moisture can be quite abrupt. If cotton is picked moist ginning results suffer, therefore time of day and prevailing weather conditions must be monitored and taken into consideration.

From a ginner's perspective, higher moisture also means higher energy use and longer processing time, which no-one wants. High moisture is also often associated with higher trash content.

Round modules

Higher moisture levels in round modules have also been noted by ginners and researchers picked with the new John Deere 7760 pickers. This has been attributed to operators now picking longer into the evening as the labour requirement has been so dramatically reduced in comparison to using older style harvesters, module builders and so on.

About 35 percent of the 2010-2011 crop was picked with the JD 7760, then in 2011-12 this grew to approximately 60 percent with around 228 pickers in the field. This season more than 300 machines, will take to the fields.

The *Australian Cotton Production Manual* outlines some other characteristics of round modules which further highlight the need for diligent monitoring of seed cotton moisture.

Round modules are smaller in size (four to 4.2 bales) when compared to the traditional 36 or 40 foot module (22 to 28 bales). This means that there will be less dilution of the cotton from across different picking times and moistures. The last round module picked each night will have significantly higher moisture than those picked in the middle of the day. From a ginner's perspective this is an issue as they are unable to respond to rapidly changing moisture levels to gin efficiently.

Round modules are twice as dense as conventional modules. The increased density as well as the plastic covering the module reduces the rate of moisture transfer to the atmosphere.

Round modules clumped tight in sausage formation will also limit airflow between modules.

Isolation for express ginning of high moisture round modules can also be difficult, as they can be lost in the multitude of modules produced in a shift. Cartage of several (five to six) round modules can also make isolation of these modules at the gin difficult.

Increased communication

Increased communication between farm managers and the gin is another step to avoiding the problems associated with high moisture. Notifying the ginner that there are modules that may be moist so that they may be ginned first, or at least monitored in the module yard is good practice.

Keep good module records

Identifying when and where each module is produced on a farm can help with producing better fibre quality outcomes as the grower can discuss with the ginner the quality of the cotton of each module and thus tailor the ginning process to suite. The grower can also use these records to better understand the variability that exists in their fields to refine management practices for that particular field in subsequent seasons.

Each module should have a record (with a duplicate kept in a safe place), which includes the date and weather conditions when picked. Any records or numbers assigned to modules should be as permanent as possible. Permanent marker pens should be used on cards, placed in a sealable plastic bag and attached to the module. If a module is suspected of having a contaminant, clearly identify it, and notify the gin when delivering the module of the potential problem.

Staging modules correctly can also help ginners manage moisture. Correct staging means organising modules sequentially in-field and ensuring they are tagged correctly so they can be delivered to the gin where they are processed sequentially.

This gives the ginner a more linear ginning pattern from dry to moist or vice versa depending on time of day picking started/stopped therefore more efficient ginning. It also allows gins to give better feedback to growers on in-field variations in yield and quality.

More information

Cotton Production Manual 2012
FibrePAK
*my*BMP and for downloading resources such as a module information record sheet.
Harvest BMP 2013

A GOOD HARVEST IS A SAFE HARVEST

THE BEST WAY GROWERS CAN ENSURE A SAFER HARVEST IS TO MAKE SURE ALL PEOPLE INVOLVED ARE AWARE OF THE HAZARDS AND THEIR INDIVIDUAL ROLE AND RESPONSIBILITIES FOR HELPING TO MANAGE SAFETY.

This is particularly important for all contractors and any new employees unfamiliar with the various operations during cotton harvest. Cotton growers must ensure that all members of the harvest crew, including contract workers undergo an induction where their safety responsibilities can be outlined and any potential hazards identified. All the procedures including specific work rules for managing safety must be clearly communicated during the pre-harvest induction.

Making the job easier for employers is the CRDC *Cotton Harvest Safety* DVD which is an ideal induction tool, it demonstrates and explains the harvest process and outlines important precautions to help avoid accidents and injuries from key hazards such as powerlines, module builders, fire and a range of hazards associated with cotton harvesting machinery. The DVD can now be viewed as separate chapters on YouTube.

The broad adoption of the new round bale pickers has revolutionised cotton harvesting. Improved efficiency now means less people and far less equipment may be required in and around the field. However, a new challenge has emerged with picker operators now often working in isolation.

Isolation and working for extended periods have been highlighted as hazards by the Australian Centre for Agricultural Health and Safety prior to the release of the round bale pickers, but with no need for module building or boll buggy crews, operators are now working more in isolation.

In these cases communication with the driver on a regular basis is critical. In an emergency, first aid may be some distance away, so procedures need to be in place to check-in with harvest operators and an action plan ready in case of emergency.

The risk of this harvester coming in contact with power lines when a bale is ejected is also heightened if the risk is not identified to drivers.

For increased general awareness of powerlines, harvest contractors and new workers should be given farm maps indicating the location of power lines, as traditional module builders, trucks and boll buggies also have the potential to hit power lines and the machine doesn't have to touch the lines, as the electricity can cross a small gap.

COTTON HARVEST SAFETY: VIDEO RESOURCES

CRDC has now made its popular *Cotton Harvest Safety* DVD available on-line.

By involving all employees and contractors in safety protocols, firstly by completing a safety induction before they start working, lays down what is expected of workers. It also establishes safety rules and provides an introduction to the key dangers and how to prevent injury. All workplaces must have rules and guidelines to ensure that safe work practices are followed. The DVD can be ordered from CRDC on 02 6792 4088 or www.crdc.com.au or for ease of viewing, a series of 13 clips has been uploaded on YouTube.

Good safety communication and co-operation between management and all workers is a key to having an incident free and safe productive harvest.

Using the Australian Centre for Agricultural Health and Safety's *Managing Cotton Farm Safety Resource Checklists and Induction Guides* will help growers plan for safe harvest. For further help contact john.temperley@sydney.edu.au at the Australian Centre for Agricultural Health and Safety on 02 6752 8210 or 0419 248 399.

LINKING GROWERS AND CONTRACTORS

The Pick N Match online service puts harvest contractors in direct contact with growers by posting the contact and equipment details of contractors on the Cotton Australia website.

With a large crop again this year, demand for contractors is expected to be high.

Cotton picking contractors can send their details directly to Cotton Australia at talktous@cotton.org.au, including the type of machinery they have, preferred areas of operation along with their contact numbers and Cotton Australia will add that information on the Pick N Match page.

The list of contractors are conveniently listed by region and growers can then freely access the page to make new connections and seek potential contractors.

Visit the pick N Match page at http://tinyurl.com/ben3pcf

see our website

WHAT WILL YOU DO WITH YOUR CROP?

AS WE HEAD TOWARD THE BUSINESS END OF THE 2013 AUSTRALIAN COTTON CROP MANY GROWERS WILL BE WONDERING HOW BEST TO MARKET THE UNSOLD PORTION OF THEIR CROP.SPOTLIGHT SPEAKS WITH PETE JOHNSON FROM COTTON COMPASS.

"The choice of what to do will depend on the individual – their appetite for risk, and their view on the market: not just the A$ cash market but potentially also the futures and/or currency markets," Pete says.

"In the following table, Cotton Compass has tried to outline the pros and cons of some of the more common and/or discussed alternatives available.

"Whatever choice is made – it is important to understand (and it is often overlooked) exactly what set of market outcomes you are 'punting on', and whether or not the alternative is actually suitable for your circumstances.

"This table does not constitute advice – and is in no way complete. It is just a quick and ready reference for consideration."
www.cottoncompass.com.au

End Of Season Marketing Alternatives – What's Best For You?

	What are you "punting on"	Pros	Cons	Who might this be suitable for?
Cash it out (fixed bales and/or balance of crop)	By taking the "cash on the day", you are basically biting the bullet and accepting the price.	• **Cashflow:** You will get 100% of your cash 14 days after ginning. • **Known outcome:** Price is finalised here and now – no further downside, no more sleepless nights. • **Simplicity**	• **No Upside:** Inability to participate in any future upside in the market. • **Price:** Current price may not cover cost of production for some growers – particularly with discounts.	• If price holds above key target levels, this may be suitable for the majority! • Growers with a large portion of their crop already sold at favourable values. • Growers with high yields / unexpected surplus.
Tender it (ie gin it, class it and then sell the cotton as a classed lot)	You are hoping there may be a "premium", or at least "less of a discount" for the specific quality of cotton you produce, over and above what you may be able to achieve with a fixed price +/- the P&D sheet.	• **"Fair" Value:** By offering "known quality" cotton you may be able to "beat" the P&D in the "spot" market. • **Competitive Bids:** By offering your cotton in the tender process, you will receive the best price / basis on the day for the specific quality on offer. • **Cashflow:** You will get 100% of your cash 14 days after sale.	• **Price:** The underlying price on the date of tender may not be palatable; • **Cost:** The cost of independent classing and storage is for your account; • **Quality Risk:** Your particular grade of cotton may not be desirable in the export market – meaning the P&D could have been a better option. • **Administration:** Time required to arrange classing / tender documents & communication.	• Growers with extremely high grade cotton (particularly length and strength) may get a premium; • Growers with specific "off grade" lots which may not be as heavily discounted depending on export demand; • Growers with "swaps" in place who are aiming to achieve the best basis price on the day.
Unpriced Contract	You can commit cotton to most merchants without fixing any component of the price – if you have the view that the cash price will improve.	• **100% Upside Price Exposure:** If your view is correct; • **Cashflow:** Most merchants will offer an interest free cash advance once cotton is ginned; • **Simplicity;** It is a simple process to price out your cotton – with GTC price orders on committed cotton one tool to consider.	• **Limited Competition:** You are committing your cotton to a merchant who may, or may not have the best cash price on the day you decide to price out. • **100% Downside Price Exposure;** There is no guarantee the price will go up. • **Time Limits:** Most merchants require pricing by mid Nov.	• Growers with a strong "trust relationship" with a particular merchant; • Growers who prefer to keep their marketing relatively simple – ie, this option is exactly the same as "normal" cash marketing, just without the competition of several merchants…..go in with your eyes open on this.
Basis/On Call Contract	By selling "basis only", you are hoping that both cotton futures will rise, and the AUD/USD will fall. * Note – not every merchant currently offers "basis only" contracts.	• **One leg fixed:** You can lock in "basis" with the most competitive merchant on the day; • **Fixing basis takes away possibility of price conflict –** leaving price exposure to transparent futures and currency • **Cashflow:** As above. • **Upside Price Exposure:** to futures and currency.	• **Its Complicated:** The requirement to price both currency and futures separately requires market savvy and discipline; • **Downside Exposure:** to adverse futures and currency movements; • **Spread Risk:** In the event your price targets are not reached in time and futures positions need to be "rolled".	• Experienced growers with a disciplined "traders" mentality – who can take emotion out of their marketing decisions; • Growers marketing through independent advisors.
USD/bale Contract	By selling cotton in US Dollars per bale, you are hoping for a fall in the AUD/USD.	• **Two legs fixed:** With both basis and futures effectively fixed, you only need to watch the currency – and can place orders to achieve targets. • **Cashflow:** As above • **Upside Price Exposure:** to currency.	• **Relatively simple:** Compared to just fixing one leg (basis) – ie you only have to watch the AUD/USD for final pricing signals. • **Downside Price Exposure:** To adverse moves in the currency.	• Experienced growers with an understanding of currency markets and a disciplined approach to pricing and/or target setting; • Growers marketing through independent advisors.
Warehouse it	By electing to arrange your own warehousing for your ginned cotton, you are "punting" on the market moving higher for your particular grades, in your chosen warehousing location.	• **Autonomy/Control:** You maintain ownership of your cotton in the warehouse environment. • **100% Upside Price Exposure** • **"Fair" Value** • **Competitive Bids**	• **No Cashflow** • **Costs:** Classing; Transport; Warehouse Intake; Storage; Insurance (some of which may or may not be recovered in the selling price.) • **Location:** It is important to select a "cotton specific" warehouse location that will allow "accessibility" to a majority of merchants. • **100% Downside Exposure** • **Administration Burden**	• Larger Growers with economies of scale (ie – warehouse & transport rates may be more commercial for larger volumes). • Growers with some knowledge / capacity of logistics and associated administration. • Growers with an understanding of different selling terms (ie – you will not be selling on "standard" FOT ginyard terms).
Cash it out + Buy an ICE futures call option (Guaranteed Minimum Price)	By selling for cash and buying a call option, you are aiming to participate in at least a portion of any futures market upside, whilst protecting yourself against a fall in the market. This is effectively a "Guaranteed Minimum Price (GMP".	• **Cashflow:** You receive 100% of your GMP (cash price less option premium) 14 days from ginning. • **Downside is protected** • **Upside Participation:** "Intrinsic value" of call options will rally if futures rise (but not 1 for 1 – and "time decay" will offset this.)	• **Option Premium:** The option premium will need to be paid "up front" • **Limited Upside:** Options will *not* increase in value 1 for 1 with futures – make sure you understand the concept of "Delta" • **Time Decay:** Options will lose value the closer they get to expiry. Remember, most options expire worthless!	• Growers with a clear understanding of derivative and options markets; • Growers with a "short term bullish view" on the market….ie not worried about "time decay"; • Growers who may be unlikely to do anything without the "hope" of at least some upside; • Growers marketing through independent advisors.

SHOWCASING AUSTRALIAN INNOVATION

A MEETING IN CHINA WITH REPRESENTATIVES FROM OUR BIGGEST CUSTOMER'S MILLS IMPROVES AUSTRALIAN GROWERS' FUTURE WITH LONG STAPLE COTTON AND OPENS DOORS TO IMPROVED PRODUCTIVITY GAINS.

The symposium, held in the city of Nanjing in Eastern China showcased our premium varieties and groundbreaking technology, with more than 150 attendees from China's leading cotton mills and cotton supply chain businesses pronouncing the event a great success.

The event provided an information exchange on premium varieties bred by CSIRO Plant Industry's Cotton Breeding and Biotechnology Groups and the post-harvest technologies developed by CSIRO Material Science and Engineering's (CMSE) Post-Harvest Cotton Group.

According to Research Group Leader of CMSE's Fibre Physics and Engineering Group, Dr Stuart Gordon, a large focus of the symposium was to extend Cottonspec, a program that predicts yarn quality from HVI measured fibre quality parameters.

"Cottonspec provides accurate prediction of what a good cotton mill can expect to produce in yarn quality using a particular cotton," Stuart said.

Increasing demand

"The main benefit to Australian cotton growers is increased demand for premium long staple Australian cotton via the association it provides between fibre quality and mill demand for high quality yarn.

"There is also an interest across industry in knowing the fineness and maturity values of premium fibre and the interest from Chinese mills reflects this, with mills spinning fine (premium) count yarns interested in examining or using another Australian technology Cottonscope, which measures fibre fineness and maturity separately.

"Cottonscope is the world's first instrument to measure cotton fibre fineness and maturity directly and quickly."

The Nanjing seminar was attended by some of the leading mills in China; six of which had been involved in testing and validating the Cottonspec models (for predicting yarn quality).

"All of these saw value in Cottonspec as a tool for benchmarking their yarn quality; predicting the quality of yarn from a new mix of raw fibre in lieu of actual spinning trials; and reviewing and managing raw cotton buying," Stuart said.

"Mills require regular contact, information and forums before they will take up new technology. As well, the technology benefits from the feedback given by mills."

Giving mills the edge

Cottonspec accurately describes the relationship between cotton fibre properties and key yarn properties. While Micronaire is used to describe fibre 'fineness' in the Cottonspec model due to its widespread availability, Cottonspec predictions actually improve when independent values of fineness by Cottonscope are used; improving the prediction accuracy of Cottonspec's models for yarn evenness and tenacity.

"These tools give the mills an edge when it comes to managing fibre and yarn quality; Australian growers also benefit from the strong association these tools give about Australian fibre quality," Stuart said.

"Growers who utilise fineness and maturity values to market their cotton put themselves in a strong relationship with mill buyers, because of the extra information."

Coupled with the demonstration of Cottonspec, CSIRO Plant Industry's Business Manager Lionel Henderson used the symposium to tell Chinese mills about its Cotton Breeding and Biotechnology groups, and developments in the production of new long staple Australian cotton for high quality yarn.

The symposium was instigated by the Australian industry and sponsored by CSIRO, CRDC, Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF) and Australian Cotton Shippers Association (ACSA), with Nanjing, capital of the Jiangsu province selected as host due to the high concentration of cotton mills there and in neighbouring provinces.

A cross-section of the Australian industry was represented at the event.

DAFF Agriculture Counselor in Beijing, James Lee spoke about agricultural co-operation between Australia and China. Representatives of Cotton Australia, ACSA and CRDC also spoke about Australian cotton production, quality, logistics, research and development.

The symposium was organised with the help of the Nanjing Office of the State Development and Investment Corporation (SDIC) and the corporation's General Manager Ms Xiaoxiong Yang, and Cotton Australia Chair Lyndon Mulligan gave the welcoming and opening speeches.

Further information

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email us

The group gathered in Nanjing, Eastern China for a symposium with leading mills and others involved in cotton supply chain businesses. At front are (from left) Prof. Xungai Wang (Deakin University), Dr Shouren Yang (CSIRO), Arthur Spellson (ACSA-Auscott), Dr Stuart Gordon (CSIRO), Glenn Rogan (Rogan Pastoral Company), Phil Ryan (ACSA-Olam), James Lee (DAFF-Beijing), Lyndon Mulligan (Cotton Australia), Dallas Gibb (CRDC), Lionel Henderson (CSIRO), Rene van der Sluijs (CSIRO), Greg Parle (CCAA-Auscott), Ashley Power (Auscott) and David Pardoe (AFFRIC-Deakin University).

(CCAA – Cotton Classers Association of Australia; AFFRIC – Australian Future Fibres Research and Innovation Centre.)

PUPAE BUSTING IS ESSENTIAL FOR RESISTANCE MANAGEMENT

WITH MORE THAN 90 PERCENT OF COTTON GROWN IN AUSTRALIA UTILISING THE BOLLGARD II TECHNOLOGY, EFFECTIVE RESISTANCE MANAGEMENT IS VITAL TO THE LONGEVITY OF TRANSGENIC COTTON IN AUSTRALIA. SALLY CEENEY REPORTS.

CSIRO's resistance monitoring research shows that in both of the target pests, *Helicoverpa armigera* and *H. punctigera*, resistance genes to Cry2Ab are present, are higher than expected, and are probably increasing, making resistance management arguably one of the most important issues currently facing the industry.

Pupae busting is an essential component of the Bollgard II Resistance Management Plan (RMP).

Why pupae bust?

As autumn approaches in temperate regions day length decreases and temperatures begin to cool, triggering mature *Helicoverpa* larvae to enter a diapause phase in the soil. This dormancy strategy allows the pest to survive the winter months in temperate regions when host plants are scarce and temperatures are generally too low to allow successful development.

Cultivation of the soil between seasons, during the dormancy phase, is an effective way of preventing any moths that developed resistance in the previous year from contributing to the population in the following year.

Although it is known that few larvae will survive in Bollgard II crops, those that do are more likely to be resistant and so are precisely the ones that should be targeted to prevent them emerging and contributing resistant genes to the population the following spring.

While the numbers of pupae killed may seem small, the proportions of resistant individuals are high, meaning that taking this group out of the overall population can have a big impact on the frequency of resistance in that population.

In Central Queensland, due to the warmer temperatures, *Helicoverpa* pupae produced late in the season do not remain in the soil but emerge within 15 days of pupating, making pupae busting ineffective. Late season trap crops are used as an alternative.

Trap crops of pigeon pea are timed to be at their most attractive after the cotton has cut out. Moths emerging from the Bollgard II fields late in the season should be attracted to the pigeon peas to lay their eggs. Once the cotton has been harvested the trap crops are destroyed and cultivated to kill the larvae and pupae.

History offers proof of success

In the early 1990s CSIRO researchers led by Gary Fitt showed that single operations reduced pupal survival by up to 90 percent, depending on timing and the method used, cementing the role of pupae busting in resistance management.

Prior to this, pupae busting had become a mainstay in the cotton industry due to its success in helping to delay resistance to insecticides in conventional cotton. It became widely adopted as part of the industry's voluntary Insect Resistance Management Strategy(IRMS).

Because of the success of the pupae busting tactic in this era and the confirmation of the tactic's validity through research, it followed that the industry adopted it as a tool for delaying resistance in Bt cotton from its introduction in 1996.

Pupae busting requirements

According to the RMP, pupae busting of all Bollgard II crops in NSW and Southern Qld should occur within four weeks of harvest and must be completed by July 31. Soil disturbance must occur to a depth of 10cm across the whole soil surface.

Soil disturbance of the unsprayed refuge associated with Bollgard II crops should not occur until all the pupae busting in the Bollgard II has been completed. Ideally, unsprayed refuges should be left uncultivated until the following October.

This ensures maximum emergence of late pupae from the refuges in the following spring. These emerging moths have not been exposed to the Bt toxins and can out-cross with moths in the general population, thereby helping to dilute resistance.

Busting these little pupae is an essential component of the Bollgard II Resistance Management Plan. Pupae busting is a proven effective means of destroying over-wintering pupae which are the section of the population with the highest probability of carrying resistance into the next season.

Pupae busting in conventional sprayed cotton remains an important component of the IRMS however the use of the Helicoverpa Diapause Emergence Tool, available on the CotASSIST website, has meant there is now some flexibility for growers.

Models based on long term weather records show crops defoliated before March 9 are less likely to harbour resistant diapausing *Helicoverpa* and do not need to be pupae busted. It is recommended that fields defoliated after March 9 be pupae busted as soon as possible after harvest and no later than the end of August.

Pupae busting methods

There are a variety of implements that can be used to achieve soil disturbance of 10cm. The method chosen will depend on a range of factors including soil moisture and farming rotation (eg whether the field is going back into cotton, fallow or a winter crop). Effective pupae busting and crop destruction can also aid in the reduction of ratoon and volunteer cotton plants the following season.

The following table shows some general guidelines of the adequacy of typical cultivation equipment for effective pupae busting:

Tips for improved effectiveness

Luke Sampson, Monsanto Regional Business Manager for Bourke, Macquarie and Southern NSW, has shared some top tips for effective pupae busting:

- Work with your Technology Service Provider (TSP) to ensure your pupae busting operation is effective from the start
- Regularly check the level of soil disturbance achieved, particularly when moving into new fields or variable soil types
- Unsprayed refuge areas do not need pupae busting
- Achieving effective pupae busting can be more difficult in dry conditions. Again, work with your TSP to ensure soil disturbance is adequate. This may help prevent having to perform multiple passes.

Crop destruction

Luke also points out that effective crop destruction can not only assist with pupae busting, but can also help reduce volunteer and ratoon cotton the following season:

- Root-cutting is highly recommended to prevent regrowth of ratoon cotton and improve soil disturbance in the plant line.
- Early incorporation aids in the breakdown of any residual seed cotton which helps in reducing volunteer numbers the following summer

The future

With Monsanto currently working to introduce a third generation Bt technology, it is important to ensure that future RMPs are as robust as possible in managing resistance, while still being practical and achievable for growers.

The industry is investing in a number of research projects to ensure that the development of new RMPs for this and other potential Bt technologies in the future can be well informed by locally relevant science.

Pupae busting is a proven effective means of destroying over-wintering pupae which are the section of the population with the highest probability of carrying resistance into the next season.

However, from a farming perspective there are some drawbacks.

Firstly, pupae busting is incompatible with minimum tillage, which is widely adopted bringing many benefits including reducing soil erosion, conserving soil moisture and improving carbon sequestration. These issues are most pressing for dryland cotton growers, since irrigated growers often have to perform tillage operations in normal ground preparation, especially for back-to-back cotton crops

Yet even for irrigated growers, the need to pupae bust can often restrict rotation crop options, and prolonged wet weather can expose growers to the risk of being non-compliant with their RMP. There is also an expense involved, growers estimate pupae busting costs between $40-55/ha, depending on field rotation and the operation performed.

Research underway for alternatives

CRDC is currently funding research projects investigating the potential of novel ways to reduce the resistance risk associated with pupal survival and late season moths that may emerge prior to

Generally satisfactory	**Inadequate alone** (more than one of these options may be required)	**Unsatisfactory**
chisel, disc or blade plough	centre busting	stalk pull (wet)
stalk pull and go – devils or lillistons plus alabamas	stalk pull (dry), rake and burn	phoenix harrows
cultivators with wide sweeps	go-devils	drag harrows
planters with cultivating tines	stubble mulchers	direct drill planters

"WHILE THE NUMBERS OF PUPAE KILLED MAY SEEM SMALL… THE PROPORTION OF RESISTANT INDIVIDUALS IS HIGH."

Pupae busting is the proven and effective means of destroying over-wintering pupae which are the section of the population with the highest probability of carrying over resistance to the next season.

pupae busting occurring, which is a potential risk particularly in early maturing crops.

Professor Peter Gregg and his team are researching the potential of using moth attractants and insecticides to control moths emerging late in the season. The use of Magnet, a registered moth attractant, combined with low rates of insecticide applied in small bands (every 70-140m) across a field has shown some potential in being a cost effective, IPM-compatible means of removing these late emerging moths.

Research is also being conducted by CSIRO and collaborators to investigate the application of certain chemicals late season that have the potential to disrupt the pupal development stage of *Helicoverpa* sp. as a potential alternative to pupae busting.

It is not expected that these methods will fully replace pupae busting in all future RMPs but it is hoped that the techniques may improve the robustness of RMPs and that there may be some potential to increase the flexibility in RMPs for growers while offering protection for the next generation of Bt cotton.

Such changes to the RMP would be determined by the response of the government regulators to submissions by technology providers, advised by the Transgenic and Insect Management Strategy (TIMS) Committee of Cotton Australia.

More information

Sally Ceeney ms.ceeney@gmail.com
Cotton Pest Mangement Guide – available on-line at www.crdc.com.au or phone 02 6792 4088 to order a hard copy.
www.cottassist.com.au

email us

see our website

MANAGING COTTON CROP RESIDUES

D&D TEAM LEAD TECHNICAL SPECIALIST SUSAN MAAS TALKS ABOUT PREVENTING RATOONS FROM CARRYING OVER.

Deciding what to do with crop residues depends on the disease status of the field and the farming system.

"Getting rid of the crop post-harvest can be difficult and resource intensive, however it really is the first step in terms of best practice for your future cotton crops," Susan says.

"Best practice in this area is often conflicting, as there is no one size fits all recommendation for stubble management.

"Deciding on what to do with crop residues really depends on the disease status of individual fields, and the farming system.

"Where Verticillium wilt is present, research has found that incorporation of cotton residues soon after harvest is beneficial.

"This process allows for the rapid breakdown of plant material, preventing further build-up of inoculum.

"In contrast, Fusarium can survive on plant residues as a saprophyte, so fields that are known to have Fusarium wilt, should have stubble retained on the surface of the soil; for this reason root pulling and mulching is also preferred."

Susan emphasises that growers should aim for the removal of all disease hosts, which includes many weeds as well as cotton.

"Inoculum for soil borne diseases can build up if hosts are present so clean fields are very important," she said.

"The value in reducing Fusarium wilt from root pulling and mulching, can be undone, if conditions are not suitable for use of this equipment, and a high number of ratoons are left behind.

"This also increases the risk of virus and additional pest problems in future crops. Root cutting can be more effective across a broader range of soil conditions however care still needs to be taken to ensure thorough crop destruction.

"More than one operation may be required to achieve 100 percent control of ratoons, and when you look at the risks, such as mealybug, CBT, and overwintering aphids, 100 percent is all that can be acceptable if you are intending on growing cotton again."

Need we say more? Healthy, older cotton plants left to prosper. and harbour disease and insect pests over autumn and winter.

WINTER WAR ON WEEDS STARTS NOW

REPORTS FROM RESEARCHERS IN THE FIELD SUGGEST THAT WITHOUT GOOD MANAGEMENT OF PEST AND DISEASE HOSTS OVER AUTUMN AND WINTER, IT COULD ONLY BE GOOD LUCK THAT SAVES THE INDUSTRY FROM CROP FAILURES NEXT SEASON.

Carry over cotton from previous seasons (ratoons and volunteers) is a major concern for industry researchers and technical specialists. The frequency of cotton plants surviving on farms from one season to the next is already high and increasing at an alarming rate.

"The ability for plants in and around cotton fields to harbour pests and diseases from one season to the next cannot be underestimated and the impact of this cannot be understated," says Susan Maas, the Cotton Industry D&D Team's Senior Technical Specialist Disease, IPM and Biosecurity.

Surveys tell story

Information on the occurrence of volunteer cotton was collected during the annual disease surveys and was based on visits to 21 farms in Queensland and 54 farms in NSW during November and December 2012 (Table 1). This data has been collected and collated as part of the NSW and Qld Disease Surveys.

In NSW the percentage of farms that had volunteer cotton in the channels/roads/fence lines; fallow/rotation fields; and in current cotton early in the 2012/13 crop compared to that determined in spring 2011 has increased from 71 to 81.5 percent while in Queensland there was an increase from 52 percent to 71 percent for the same period.

"Unfavourable weather conditions in several districts pushed out picking in the 2011/12 season and this may have hindered attending to the removal of volunteer cotton," Susan said.

"However, the importance of removing volunteer plants cannot be over emphasised as the presence of volunteer plants surviving over from the previous season enables pests and pathogens such as aphids, mealy bugs

Spring 2012	% Farms surveyed with volunteers surviving from previous season near **Channels/Roads/Fences**	% Farms surveyed with volunteers surviving from previous season in **Fallow/Rotation fields**	% Farms surveyed with volunteers surviving from previous season in **Current Cotton**	% Farms surveyed with volunteers surviving from previous season **Total**
QLD	52.4%	9.5%	52.4%	71.4%
NSW	40.7	26.5%	74.1%	81.5%

Table 1. The occurrence of volunteer cotton plants surviving from the previous season on farms in Queensland in the spring of 2012.

and cotton bunchy top to overwinter and initiate new outbreaks in the spring."

Cotton bunchy top threat

DAFF Qld Virologist Murray Sharman told *Spotlight* he had seen high numbers of cotton plants infected with cotton bunchy top virus (CBT) growing alongside this year's crops. CBT is a plant virus spread by cotton aphid and causes stunting of plants, reduced leaf and fruit size, reduced internode and petiole length, reduced yield as well as distinctive mottling of leaves. Its economic impacts can be sizeable.

"If conditions are right, CBT can be very damaging. In 1998/99 CBT reduced yields by 25 percent on 21 percent of the growing area, equating to a 5.2 percent loss across the whole industry at a cost of $140/ha," Murray warns.

"Ratoons (stub cotton) are a particular source of concern.

"A number of fields had a very high number of ratoons in a row directly adjacent to the field and in one case there were 76 plants over 40 metres, where two thirds of these plants were CBT-infected.

"Often there were no CBT-infected plants in this year's crop but it is likely this was only a matter of luck that there were no aphids present to move the virus into the crop.

"If aphids were also present there may have been significant disease and yield loss.

Reshooting ratoons in a fallow block next to this year's cotton. Courtesy Murray Sharman

Forty-nine out of 76 ratoons had cotton bunchy top in one 40-metre strip of ratoons growing along the outside row of crop.
Courtesy Murray Sharman

Typical reshooting of ratoon from below ground level. Courtesy Murray Sharman

"The dry spring 2012, masked the survival of ratoons in some fallow fields and it has only become apparent with summer rain that there were vast numbers of ratoons surviving

"The risk to future crops is very serious."

Further weed hosts identified

Recent research by Murray Sharman in collaboration with Dr Lewis Wilson and Tanya Smith (CSIRO Plant Industry) has confirmed more weed hosts in addition to the already identified CBT weed host, *Malva parviflora* (Marshmallow). These are:

Anoda cristata (Spurred anoda)

Abutilon theophrasti (Velvetleaf, American jute, Chinese hemp, Chinese jute, Chinese lantern etc)

Hibiscus sabdariffa (Rosella)

Chamaesyce hirta (Asthma plant, flowery headed spurge), Asthma plant (family Euphorbiaceae) is the only non-Malvaceae species identified as a host of CBT virus so far but this does suggest that the virus may have a wider host range than originally thought.

As the virus can only survive in living plants (ratoon/volunteer cotton is often the only obvious source of the virus nearby to crops) growers have an opportunity now to break the disease cycle by controlling these host plants, especially the volunteer and ratoon cotton.

Thanks to Karen Kirkby and Peter Lonergan (NSW DPI); Linda Smith and Murray Sharman (DAFF Qld) and Stephen Allen (CSD) for their assistance.

Further information

Industry has come up with guidelines for controlling volunteer cotton, the Cotton Pest Management Guide contains detailed information on control measures.

MEALYBUG IS A DIFFICULT PEST TO MANAGE. WITH NO INSECTICIDE CONTROL MEASURES OF ITS OWN AND EASILY FLARED BY INSECTICIDES TARGETING OTHER INSECTS, GOOD IPM, ESPECIALLY CONTROLLING WINTER WEED HOSTS SUCH AS RATOONS HAS NEVER BEEN MORE IMPORTANT.

DOWNS' MEALYBUG OUTBREAK HIGHLIGHTS NEED FOR WAR ON WEEDS

DAFF Queensland entomologists have confirmed a small outbreak of Solenopsis mealybug (*Phenacoccus solenopsis)* on a cotton property west of Dalby on the Darling Downs.

This is the same species of mealybug that first adversely affected cotton crops in Emerald and the Burdekin in 2010 and more recently in the South Burnett.

Mealybug had previously been found on the Downs but in very low numbers, "one or two here and there," according to DAFF QLD entomologist Moazzem Khan who is working on a CRDC-funded project looking at management options as well as assessing damage in relation to a crop and mealybugs' stage.

"When infested at the early development stage, plants often exhibit distorted terminal growth and crinkled and bunchy leaves, in severe cases plant death will occur," Moazzem says.

"However late season cotton crop infestations can cause squares and small bolls to drop, as well as fewer, smaller and deformed bolls and premature crop senescence.

"Mealybug also produces honeydew which contaminates cotton lint and promotes the growth of sooty mould fungi that reduces photosynthesis which can lead to later downgrading of fibre due to contamination and discolouration and discounts to growers."

Management

There is no insecticide registered for the control of mealybug in cotton.

"There are a number of management options that can reduce infestations and the overall impact of this pest," Moazzem explains.

"Observations made this season in Emerald suggest that continuous high temperatures may promote mealybug populations to expand, however growers can influence the size of the starting population through good farm hygiene, and good IPM, will help to prevent flaring of hot spots."

Moazzem and his team have been monitoring populations throughout the year. Mealybugs multiply on a wide range of hosts and may initially breed on weeds before migrating to cotton crops.

"They will also breed to very high numbers on ratoon and volunteer cotton, moving on to the roots during cool weather, and then as soon as temperatures begin to rise, moving above ground to recommence breeding," Moazzem said.

"This can result in very high numbers in field that are able to take advantage of seedling cotton, and do the most damage.

"Other weeds of concern include pig weed, parthenium and amaranth, and as the mealybugs can be underground, don't assume because you can't find mealybug that they aren't there.

"Maximise the amount of host-free period prior to planting by ensuring that all cotton is removed from the field in a timely manner and that follow up weed control is conducted.

"Isolated cotton plants should be physically removed."

Control through IPM

Where mealybugs are established in an area, Moazzem encourages growers and consultants to focus on their IPM.

He said experience from earlier outbreaks as well as field trials have confirmed that there is currently no clear insecticide controls for mealybugs, and there may not need to be one. Natural enemies such as cryptolaemus and other lady beetles, lacewings, spiders and cockroaches play a vital role in keeping mealybug under control.

"We have also recently identified that there is a parasitoid of mealybug, *Aenasius bambawalei*, also providing control of this pest," Moazzem said.

"Once you have mealybugs, every spray decision needs to be carefully thought through as flaring is a real risk.

"Broad spectrum products are

COURTESY GAIL SPARGO

COURTESY GAIL SPARGO

LEFT & BELOW LEFT: Mealybugs breed to very high numbers on ratoon and volunteer cotton, moving on to the roots during cool weather, and then as soon as temperatures begin to rise, moving above ground to recommence breeding.

"THEY WILL BREED TO VERY HIGH NUMBERS ON RATOON AND VOLUNTEER COTTON."

extremely high risk, however any disruption to beneficials could result in flaring if conditions are right."

Careful insecticide choice vital

This was demonstrated in 2012, in a conventional cotton crop in the Byee area on the South Burnett that was severely affected by mealybug infestations; however an adjacent crop had very low numbers. Why?

The main management difference between the crops was the use of insecticides. The crop with high mealybug numbers was sprayed with seven different insecticides targeting tipworm, helicoverpa, aphids and green vegetable bugs. Mealybugs were observed from flowering onwards and were present throughout the season with numbers increasing progressively.

Mealybug numbers only declined towards the end of the season when insecticides were no longer applied and beneficial insect numbers increased within the crop.

A stressed northern experience

Experience from Burdekin and Emerald have also identified that areas of field where there are stressed plants are more likely to experience an outbreak.

Researchers are not sure if it is mealybugs are more attracted to these areas, or if the outbreaks occur due to increased mealybug reproduction in response to changes in plant sugars from the plant stress, according to Susan Maas.

"Reduce plant stresses where possible through optimal nutrition, and water management, and ensure that known stressed areas are monitored to help with early detection," she advises.

Experience in Emerald supports this message that a combination of good farm hygiene, and strong IPM focus is the key to managing for mealybug.

Jamie Iker, an agronomist from Emerald told Spotlight those mealybugs are certainly a challenge.

"If mealybugs are about in reasonable numbers early in the season, it makes decisions for other pests really difficult, as even some of the softer products can flare them.

"Generally speaking I have found that the cleaner a farm is over winter, the less pest problems we will have the following season."

Emerald cotton grower Dougall Millar said farm hygiene had always been important to him, however "We have taken a zero tolerance attitude since mealybugs became a problem," he said.

"It is worth the effort to walk into a field to remove a plant to prevent an early outbreak in the following season."

MOAZZEM'S KEY TIPS TO GROWERS ARE:

- Weeds, including volunteer/ratoon cotton, in and around fields should be removed.
- Do not throw uprooted weeds into water channels.
- The removal of affected plants at the early stage of infestation may reduce mealybug numbers in the rest of the crop. Keep infested plants inside a closed plastic bag for long enough to kill them.
- Practice Come Clean Go Clean between farms. Clean all equipment that has been in affected fields.
- Natural enemies such as *cryptolaemus* and other lady beetles and lacewings play vital role in keeping mealybug under control.
- In the management of other insect pests, aim to conserve natural enemies of mealybugs, by adhering to thresholds, and selecting the 'softest' option if an insecticide is required.
- Mealybug outbreaks are more common on areas of stress plants. Reduce plant stresses where possible through optimal nutrition, and water management.

Mealybugs living on parthenium root system.

COURTESY GAIL SPARGO

Research has uncovered more knowledge of weed hosts for mealybug, and just because you can't see them doesn't mean they're not there, as they have the ability to live on the roots, as shown on this pigweed.

COURTESY GAIL SPARGO

How do they spread?

Localised movement of mealybugs occurs when juveniles (crawlers) move from infected fields to adjacent healthy crops. The waxy coating on the mealybug crawlers also facilitates passive transport of the insect by sticking to equipment, other insects (eg bees), birds, animals or people. Small crawlers are also readily transported by wind and rain or in water through irrigation channels. Long-distance movement through the transport of infested plants is also possible.

Industry scientists, researchers and technical staff are therefore encourages growers to practice Come Clean Go Clean, and monitor for the presence of mealybug.

Growers and consultants are asked to please report any infestations of mealybug to DAFF Qld's Dr Moazzem Khan (07 4688 1310) or Kristy Byers (07 4688 1535).

For more information about mealybug, please refer to previous *Beatsheet* articles by selecting mealybug in the 'categories' section http://tinyurl.com/b85m7rn

see our website

Thanks to Kate Charleston for her assistance and Damien Sippel from BGA Agriservices for providing the information about flaring of mealybug.

PARASITES POSE SERIOUS RISK

COTTON INDUSTRY SPECIALISTS HAVE JOINED TOGETHER TO GIVE THIS VALUABLE INFORMATION AND WARNING ON THE RENIFORM NEMATODE.

In late 2012, reniform nematodes (*Rotylenchulus reniformis)* were recorded affecting cotton across a number of fields and farms in Theodore in Central Queensland. While known to be wide spread in tropical and sub-tropical Australia, this nematode species has only been found in Australian cotton once before.

Plant parasitic nematodes occur widely in Australia but are not normally observed in cotton, probably because of the heavy texture of cotton soils in Australia. Unlike other problem nematodes, reniform nematodes are a concern as they are more suited to the heavy clay soils.

Reniform nematodes cause economic damage in two ways.

High control costs

The nematode feeding causes damage to the plant resulting in stunting and generally poor plant growth. Overseas experience suggests that yield losses can be severe with very high populations, and in the US in extreme cases fumigants are used at a cost of more than $400/ha.

In addition nematodes can interact with certain fungal pathogens in disease complexes. The damage caused in these complexes is more severe than from either the nematode or the fungus alone. It is not yet known whether this interaction is likely to occur with Australian strains of disease and with Australian varieties.

HOW TO GET A SAMPLE AND WHERE TO SEND IT

Scrape off the dry top soil and sample 10-15cm deep using a small trowel or soil corer. Place approximately 400 grams in a clearly labelled plastic bag. Keep cool in an Esky *without ice*. Do NOT store samples in fridge. Never post on Thursday or Friday. Send samples and sampling information including location and contact details to: ATTENTION: Jennifer Cobon Level C2 West, Ecosciences Precinct, B3 Joe Baker Street, Dutton Park Qld 4102.

ABOVE: QLD DAFF Entomologist Linda Smith has been investigating the parasite – only detected in cotton once before – and how to halt its spread.

Management options

In other countries, nematode management in cotton is based on crop rotation, variety selection and nematicides with pre-season sampling for nematode populations. Cotton following peanuts, maize, rice and grain sorghum will generally have lower reniform nematode numbers, whereas cotton monoculture will result in higher nematode populations.

In severe infestations, nematodes may require up to two years of rotation crops, grown in sequence, to lower populations below economic thresholds.

Further investigations are continuing to determine the extent and likely severity of this pest in the Australian cotton system.

Thanks to Linda Smith, and Bartley Bauer (DAFF QLD) for assistance with this article.

THE KEY MESSAGES TO INDUSTRY ARE:

Come Clean. Go Clean

Unaided nematodes only move a few metres a year in soil, but dirty equipment, vehicles and boots can spread them far and wide. Ensure vehicle, equipment and people are clean before coming on to your farm. Provide wash down facilities so that vehicles, equipment and people leaving your farm can clean down and arrive clean at their next destination.

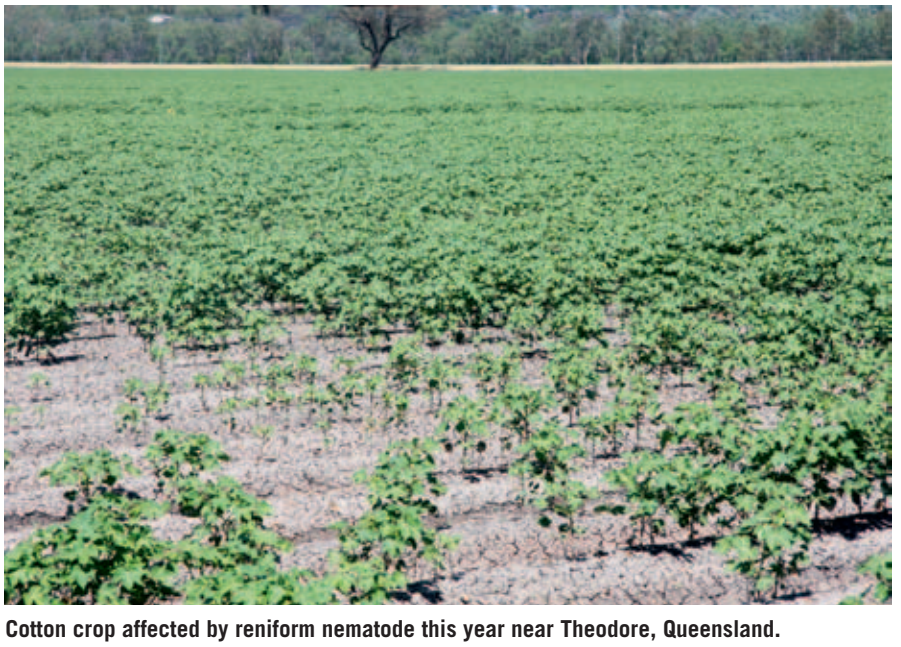
Monitor

For patches of unexplained unthrifty plants, and send a sample of soil if concerned.

REMINDER:

AGRIRISK-SPONSORED COME CLEAN GO CLEAN SIGNS AND STICKERS FOR YOUR FARM ARE AVAILABLE BY CONTACTING SUSAN MAAS. (susan.maas@crdc.com.au)

email us



Cotton crop affected by reniform nematode this year near Theodore, Queensland.

STAYING ON THE PATH TO DISEASE DETECTION AND PREVENTION

PATHWAY HAS RECORDED MORE THAN 50 ENQUIRIES SINCE JULY LAST YEAR, AND HAS BEEN INSTRUMENTAL IN IDENTIFYING A THREAT TO COTTON PLANTS WHICH HAS THE ABILITY TO SEVERELY AFFECT PRODUCTION, THE RENIFORM NEMATODE.

In focus – it is common not to see evidence of the parasite on the root with the naked eye, even though the nematode is present. The effects of the reniform nematode are coming into clear focus as the industry backs up its message to Come Clean. Go Clean.

NSW DPI cotton pathologist Karen Kirkby is very pleased with the progress of PathWAY.

"Having this network of really connected pathologists, virologists, entomologists, consultants and extension has enabled grower concerns to be addressed quickly," Karen said.

"At the same time PathWAY has facilitated the collection of quantitative data on disease issues.

"This data allows the issues at hand to be reported and the relevant fact sheets or information to be provided for publication."

Reniform nematode

The recent identification of reniform nematodes (*Rotylenchulus reniformis)* affecting cotton in Central Queensland is a good reminder about the importance of farm hygiene and the spread of disease. Normally nematodes only move a few metres a year in soil, but dirty equipment, vehicles and boots spread them exponentially.

"So we are really imploring growers and their managers to ensure vehicles, equipment and people are clean before coming onto their farms," Karen said.

"With the emergence of the reniform nemadote in our cotton fields, it is now imperative that there is the provision of wash-down facilities so that vehicles, equipment and people entering and leaving farms can be sure they are not carrying – and not just nematodes but a host of diseases and pests.

"We would also encourage people to monitor for patches of unexplained unthrifty plants, and send a sample of soil if concerned."

This nematode species had previously only been found once in Australian cotton. While it does not cause complete plant death, the productivity of the crop can be significantly affected.

"When infection in the root is high, nodules may be seen on the root; these are egg masses produced by the nematode which has its head buried in the root tissue," Karen says.

"However, it is common not to see evidence of the parasite on the root with the naked eye, even though the nematode is present.

"If stunted plants are observed, with or without nodules on the roots, root and soil samples can be submitted for testing to determine if reniform nematode is the cause."

For more information on collecting and submitting samples please contact Dr Linda Smith on 07 3255 4356.

Looking forward

Karen said with harvest underway it is important for growers to be thinking about stubble management after harvest.

"Importantly, management decisions will be influenced by the pathogens present within individual fields," she said.

"For fields with a history of Verticillium wilt, it is recommended that stubble be incorporated soon after harvest, whereas in fields with Fusarium wilt, stubble should be retained on the surface for a minimum of one month."

Cleaning up

Controlling weeds, volunteer and ratoon cotton is very important for reducing the impact of disease and pests. A number of broadleaf weeds such as marshmallow weed are hosts of cotton bunchy top disease, transmitted by cotton aphids.

"However the biggest problem is volunteer and ratoon cotton providing a green bridge that allows the vector to survive season to season."

Karen Kirkby
Karen.kirkby@dpi.nsw.gov.au
Linda Smith
Linda.smith@daff.qld.gov.au

email us

PathWAY

"WITH RENIFORM NEMADOTE IN OUR COTTON FIELDS, IT IS IMPERATIVE THERE IS PROVISION OF WASH-DOWN FACILITIES…"

NSW DPI cotton pathologist Karen Kirkby

CRDC SUPPORT FOR AGRONOMY

CRDC'S SUPPORT FOR THE AUSTRALIAN AGRONOMY CONFERENCE HAS BEEN APPLAUDED BY LEADING INDUSTRY RESEARCH SCIENTIST DR ROSE BRODRICK.

Dr Brodrick, who specialises in Cotton Crop Physiology at the CSIRO's Plant Industry Division in Narrabri, says the CRDC's sponsorship significantly raised the profile of cotton research at the Agronomy Conference held in Armidale late last year.

A $5000 contribution from CRDC allowed delegates to take part in a post-conference Irrigated Cropping Tour, while a student bursary valued at $1500 was also funded by the CRDC.

"On behalf of the agronomy team that attended the conference I would like to pass on the positive feedback and appreciation of the Australian Agronomy Society for the CRDC's support," Rose said.

"This is an extremely important event on the calendar of scientists and research agronomists, and much of the research that was discussed is relevant to agronomic research in the cotton industry, including genetics, fundamental plant physiology, farming systems, and web extension applications."

Presentations by Rose's research team on 'Dynamic Deficits for Irrigated Cotton', and Dr Michael Braunack's research on 'The potential for thin biodegradable film in the Australian cotton industry', were highlighted in the conference summary as important examples of innovative research in Australian agronomy.

Rose says researchers in the cotton industry are working in many of the key areas identified as future challenges for agronomy in Australia. She believes collaboration facilitated at the annual Agronomy Conference will increase the likelihood of finding innovative solutions.

"The Australian Agronomy Conference provides opportunities to exchange ideas and foster collaborations between scientists working in the same areas of research on different crops," she said.

"CRDC's sponsorship was noticed and commented on by other scientists and agronomists, as well as conference organisers, who greatly appreciated the cotton industry's generous support."

The event was attended by scientists and agronomists from diverse backgrounds, providing an opportunity for the CSIRO cotton physiology and agronomy team to showcase the work that's happening in the cotton industry and their close ties with the wider research community.

"The Australian Agronomy Conference provides opportunities to exchange ideas and foster collaborations between scientists working in the same areas of research on different crops," says CSIRO's Dr Rose Brodrick.

FUNDING TO IMPROVE IRRIGATION INFRASTRUCTURE

Irrigators with general security water entitlements operating in the NSW Border Rivers, Gwydir, Namoi-Peel and Macquarie-Cudgegong water management area are eligible for grants to undertake irrigation modernisation on their farms.

With Round two funding applications closing on April 30, interested irrigators and their advisors are encouraged to attend a series of community meetings to receive current information on the process and timeframes to apply for planning and infrastructure modernisation funding and the training opportunities available. The NSW DPI meetings will offer information to irrigators on the *NSW Sustaining the Basin: Irrigated Farm Modernisation project* (STBIFM), funded by the Commonwealth's Water for the Future initiative.

Workshops will be held at:

Goondiwindi (NSW Border Rivers & Gwydir) Thursday 21 March 2013 7.30 – 9.30 am (Queensland time) Goondiwindi Training & Technology Centre, 15-21 Russel St.

Gunnedah (Peel & Namoi) Thursday 21 March 2013 4 – 6 pm Gunnedah Bowling Club 313 Conadilly St.

Narromine (Macquarie & Cudgegong) Friday 22 March 2013 12 noon – 3 pm Narromine United Services Club.

In a first funding round last year, 32 out of 70 irrigators were successful.

NSW DPI Project Leader Rod Jackson said there had been a good response to Round one.

"Generally the applications were pretty good and represented a wide range of activities including the installation of centre pivots, storage reconstructions, pump station upgrades, supply channel upgrades and subsurface drip systems through to field redevelopment," he said.

"This is a positive outcome for both irrigators and the local regions and I would encourage other irrigators to submit an Eligibility Check Request form and consider participating in Round two."

Further information

IFM.info@dpi.nsw.gov.au or visit www.dpi.nsw.gov.au/info/sustainingthebasin http://tinyurl.com/a6x8q9c

email us

see our website

YOUNG ABORIGINAL TRAINEE PRAISES LIFE CHANGING PROJECT

SHANE TOOMEY, 23, HAS DESCRIBED A PILOT TRAINING SCHEME AS A 'LIFE CHANGING EXPERIENCE' AND IS A STEP CLOSER TO REALISING HIS DREAMS OF OWNING A HOUSE NOW HE'S GOT A PERMANENT JOB IN THE COTTON INDUSTRY.

Trainees Gus Mason, George Lamb and Shane Toomey during their training. Shane is now working full time in the cotton industry at the Australian Cotton Research Institute at Narrabri after being selected to take part in the pilot scheme supported by CRDC.

Shane is one of four trainees who took part in a 12-month pilot project offering TAFE and farm-based training for local Aboriginal people in the Narrabri district. The project is supported by CRDC through funding from the Australian Government's Caring for our Country initiative.

Shane's new role is as a farm-hand with NSW Department of Primary Industries, based at the ACRI (Australian Cotton Research Institute) west of Narrabri. He had completed 10 of the 12 months of the traineeship before being offered his new role.

"I am very excited about this new position," he said.

"This is a permanent job, which I am sure will open new doors for me and will give me a chance to continue to work in the cotton industry, which is something I have enjoyed during the training."

Shane had been working towards a Certificate 2 in Rural Production, combining one day a week at TAFE and four days of on-the-job training.

"My training was at the ACRI, my host farm throughout the pilot scheme, so it's a place that is familiar to me and I am really happy to have got this permanent job there," he said.

"This traineeship has been my first time into agriculture and farming. I thought TAFE might be harder, but I have handled it easily and enjoyed the learning and then putting it into action on the farm.

"It made me realise that I wanted to make a career out of agriculture.

"This has been life changing for me and given me direction."

Shane was previously employed in the local mines, but had left just before the advertisement for the traineeship was released.

"When I saw the advertisement, I wanted to apply as I felt it might be more comfortable working on farms than in the mines," Shane explained.

He said that he and his partner and three-year-old daughter hope one day to have their own home – a dream that is a step nearer thanks to his traineeship and new employment.

"We are expecting our second child this year, so it is great that I have now got this good job."

This project was one of 20 funded nationwide and is the first of its kind in Narrabri.

"The aim of the program is to enable the trainees to gain skills and experience for empoyment within the cotton industry and natural resource management through a nationally recognised qualification," says CRDC Natural Resource Management Program Manager Jane Trindall, who oversees the program.

"Farming businesses benefit from having access to additional labour and being part of a pilot program to increase capacity in the local labour market."

Shane was one of four Aboriginal trainees, all in their 20s, who had been selected from 10 applicants to take part.

Their work covered a wide range of farm activities such as fencing, chemical application, occupational health and safety, identifying hazards, assisting with the agricultural crop, applying fertiliser, weed control and operating and maintaining machinery.

Many local organisations and landholders have worked together to support this project, including the Narrabri Local Aboriginal Land Council, Australian Business Apprenticeships Centre, NSW TAFE, Joblink Plus, Namoi Catchment Management Authority and the NSW Office of Environment and Heritage.

"IT MADE ME REALISE THAT I WANTED TO MAKE A CAREER OUT OF AGRICULTURE... AND GIVEN ME DIRECTION."

ANSWERING QUESTIONS ABOUT THE INDUSTRY'S WORKFORCE

A STUDY IN THE GWYDIR VALLEY HAS REVEALED IMPORTANT INSIGHTS FOR WORKFORCE DEVELOPMENT IN THE COTTON INDUSTRY.

The research undertaken in the Gwydir is one of two case studies forming part of the CRDC Innovative Work: Cotton Workforce Development for Sustained Competitive Advantage project led by Associate Professor Ruth Nettle of the University of Melbourne. The first case study was undertaken last year in Emerald, Queensland.

The Gwydir production valley is centred on the town of Moree in northern NSW. Dr Jennifer Moffatt, University of Melbourne oversaw the project's work in Moree and Emerald, in collaboration with The University of Sydney's Workplace Research Centre. In total 21 people associated with the cotton industry were interviewed about how attraction, recruitment and retention occurred in the Gwydir.

The group included farmers, their employees, people who provide support services to the cotton industry (consultants; resellers; gins; employment agency; labour hire; contractors) and stakeholders. This was complemented by a survey of 24 cotton growers with assistance from the Gwydir Valley Irrigators Association.

Heath Estens "Beela" Moree has been using backpackers on his mixed cotton/citrus/dryland farming operation just north of Moree and says "we wouldn't survive without them". Heath is pictured with Wiebke Herrmann, from Hannover, Germany who is working in both the orchard and cotton sides of the business and will stay for the coming cotton harvest.

Barriers identified

The research found that the recent long-term drought and a 'poor public image' of Moree were barriers at the regional level for attracting and retaining a cotton workforce, with the expansion of minerals development expected to have a negative impact.

"The concerns about minerals development were echoed by survey respondents who expect they will be unable to successfully compete with the mining industry in recruitment or retention," Jennifer Moffatt said.

"However we found evidence of key industry-wide responses to ongoing workforce limits such as the rapid and high adoption of round bale pickers for harvesting cotton, which has substantially reduced the number of employees needed for this operation.

"Employing backpackers and using retention strategies to retain existing staff were also popular approaches."

The study has found that in the range of barriers to attracting and retaining staff experienced by survey respondents the most frequently mentioned was the poorer services infrastructure in rural communities, the differences in rural and urban lifestyles, and the work-life balance people desired. The inability to provide a career path, especially in the case of on-farm, non-management positions was also an issue.

A positive for the cotton industry is that interviewees reported that people were attracted to the industry as it is dynamic, describing it as "open, innovative, young, inclusive and early adopters", and the industry's reputation for profitability. An earlier attraction for employees was the high wages paid.

For some employees it was not cotton, but farming and the rural lifestyle that was attractive; for others it was the employer's reputation or perhaps that the job they found just happened to be in cotton.

Informal processes

The interviews indicate that informal processes are the cornerstone of recruitment in the Gwydir.

"This was also confirmed by the survey, with the most common recruitment strategy for permanent staff being via the networks of existing staff, for casual staff it was their own networks and overall 'word of mouth' was considered the most effective recruitment strategy," Jennifer said.

"In the interviews it became apparent just how the informal processes worked; often an employee returned to a previous employer or began as a casual, alternately they may move within the region from one farm to another; a

Wiebke Herrmann is travelling around Australia and is enjoying the work she has found at "Beela" Moree. Weibke found work in the Gwydir Valley via word of mouth – common according to a workforce study commissioned by CRDC which has examined workforces in the Emerald and Gwydir regions.

way that an employer 'advertised' these positions and a prospective employee became aware of vacancies, was through networks; it was through these processes that locals were sourced which was a preference expressed by some.

"The more formal processes involved the use of labour hire organisations, employment agencies or advertising in the paper."

Labour demand outweighs supply

A total of 210 staff was typically employed by the survey group with about one-third being casuals, a quarter senior or experienced staff and a quarter were entry level employees. However there were 50 vacancies and almost 50 more employees were predicted to be needed for the 2012-2013 season. This suggests that the survey respondents were operating on approximately two-thirds of the staff needed. In the last year 19 employers had recruited 118 employees, mostly casuals, followed by senior-experienced and entry-level recruits.

When overseas workers were employed as casuals almost all were Working Holiday/417 visa holders (backpackers). To recruit permanent staff most often took up to three months, while casuals most frequently took less than a week. In addition to the on-farm workforce, transport and spraying contractors were used frequently but harvesting contractors less so. Agronomy consulting services were frequently used but few other types of consultancy services were used often.

Strategies for retention

The researchers say the initial analysis of the interviews shows a broad range of strategies are in use to improve staff retention.

"Accommodation can be an asset for an employee but a challenge for an employer to manage the staff dynamics associated with on-farm accommodation," Jennifer said.

"With permanent staff remuneration generally being cash plus benefits, and accommodation being the second most commonly reported package item, this is an issue for many.

"Apart from accommodation, employees consider getting a promotion, having job security, being part of a team, feeling looked after, having enough time off, having a family friendly employer and a job that has some flexibility as being important."

Good news that employers may be on the right track is that the five most commonly reported retention strategies in the survey (growers) were being flexible with family time and hours of work; providing varied work to develop skills and capability; paying above award; saying 'thank you'; and matching the employee with interests and skills.

"Employers with flexibility and showing staff they are valued may contribute to the accounts of the employees who report being contented," Jennifer said.

Differing perceptions

In some areas employee and employer perceptions differed.

While pay rates were not reportedly a key attraction for the employees interviewed, above award pay was the most commonly reported package item in the survey and growers see it as an important retention strategy.

Additionally education and training was not found to be a key attraction for employees, but was among the top five most frequently reported package items mentioned by growers. Most training events were accredited, wholly funded by the employer and considered by them to be of benefit to the farm.

"This interim analysis has indicated some strengths and threats in attraction, recruitment and retention issues for the cotton industry in the Gwydir, but further investigation would be necessary to clarify some emerging issues," Jennifer said.

"For example, there is some consistency between what employees value and what growers appear to regard as important regarding retention, but is there enough overlap here?

"At the regional level, most recruitment is through informal processes which indicate a network exists, but is it being used to full effect?"

Management versus resolution

There are some threats that can only be managed, not resolved.

"These are mining and a characteristic of rural communities which is poor access to services and a lower standard of infrastructure – so what workforce development strategies have others used here?" Jennifer says.

"Key information for a workforce development strategy at the on-farm level is that half of those surveyed had a vacancy, there is heavy reliance on casual staff, and most these are 417 visa holders.

"So clearly there is an understaffing issue here.

"An impact of this is owners and managers having to work harder, but there are financial impacts too.

"Apart from the cost of round bale pickers to reduce labour demand, insurance premiums have dramatically increased for some due to claims resulting from inexperienced staff damaging equipment and others have chosen to insure substantially less to manage this cost.

"Ultimately it would appear that there are productivity losses due to understaffing."

Continuous innovation

The researchers say the cotton industry has a reputation for being innovative and using R&D to solve problems.

"The challenge for the industry is to apply these very effective strategies to its ongoing workforce limitations.

"Due to the generally cohesive nature of the cotton industry, a history of the Gwydir Valley growers and non-cotton growers working successfully on production issues and interviewees readily identifying cotton and community leaders for such an initiative, this indicates that the Gwydir has the potential to step up to progress a regional workforce development strategy."

"INFORMAL PROCESSES ARE THE CORNERSTONE OF RECRUITMENT IN THE GWYDIR..."

THE HORIZON SCHOLARSHIP PROGRAM FUNDED BY THE RURAL INDUSTRIES R&D CORPORATION AND CRDC HAS PROVIDED A FOURTH GENERATION FARMER FROM NARROMINE WITH A CHANCE TO FURTHER HIS CAREER IN AGRICULTURE.

BROADER HORIZONS FOR A FUTURE IN AGRICULTURE

Billy Browning is studying a Bachelor of Agricultural Economics at the University of Sydney and as part of his CRDC-sponsored Horizon Scholarship recently finished a stint at the Australian Cotton Research Institute(ACRI) at Myall Vale near Narrabri.

Under the supervision of Cotton Industry D&D Team Education Officer Trudy Staines, Billy was working with a number of leading researchers and scientists including CSIRO entomologists Sharon Downes and Lisa Bird, who are leaders in their fields.

Trudy said the goal of the week was to give Billy an insight into the research behind growing cotton.

"Working with a number of researchers in different fields, Billy learned a lot of different aspects of research and his experience should help him in his future," she said.

Billy says there was a lot to take in and he has gained a lot of knowledge and experience.

"Working with the guys at ACRI has opened my eyes in a way that I hadn't considered before," Billy told *Spotlight*.

"Being from a cotton farming background we only see the production of the crop, so it was a good experience for me to see the research and the development side as well.

"Everyone at the ACRI was so welcoming and helpful. Even if they were busy with their own work they would often take time out to help and talk to me. I really appreciated that."

As part of his two-week work placement, Billy also travelled to the Cotton Australia Sydney office where he worked with education co-ordinator Sophie Davidson and policy manager Angela Bradburn on some current policies CA is developing.

"Creating better connections with students studying agriculture-related degrees or certificates has been an area we hve been wanting to ramp up," Sophie said.

"Billy has been helping us understand the internship and work experience requirements of the various qualifications, student clubs and key contacts to arrange and communicate work placements.

"We are in a better position to create opportunities for students to engage with the cotton industry as a result."

All of this wouldn't have been possible without the help of the Horizon Scholarship program.

Billy said that the scholarship has given him the opportunity to study at a higher level and he has taken the opportunity with both hands.

"Horizon has been a fantastic help for me and also for other young people wanting to stay in the agricultural sector," he said.

"It has helped the young people involved in agriculture to stay passionate and motivated about the industry.

"It has also given me great insight into the future of youth in agriculture."

Billy is yet to decide on his career path after university but many avenues of opportunity are open to him.

"Ag finance is definitely an opportunity but I am currently also looking at the possibility of agricultural psychology," he says, "I am excited about what the future holds and I have Horizon to thank for giving me the opportunities."

Last year CRDC sponsored a second Horizon student for the first time, and was the only R&D corporation to do so. Kirsty McCormack is undertaking a Bachelor of Rural Science at The University of New England. Her passions are for agronomy and genetics and she is interested in careers in agronomy, research or animal reproduction. Kirsty will join the industry later this year to undertake her industry placement.

Agriculture offers the most dynamic and diversified number of career pathways of any industry in Australia. The cotton industry offers a very diverse range of jobs for university graduates, including biochemistry, agricultural engineering, in-field agronomy, policy advice, investment analysis and industrial relations – to name just a few. The Horizon Scholarship is an initiative of the Rural Industries Research and Development Corporation. In partnership with industry sponsors like CRDC which hopes that through support of undergraduates studying agriculture at university it can build the capacity of the future workforce agriculture and the cotton industry needs to maintain its sustainable, competitive advantage.

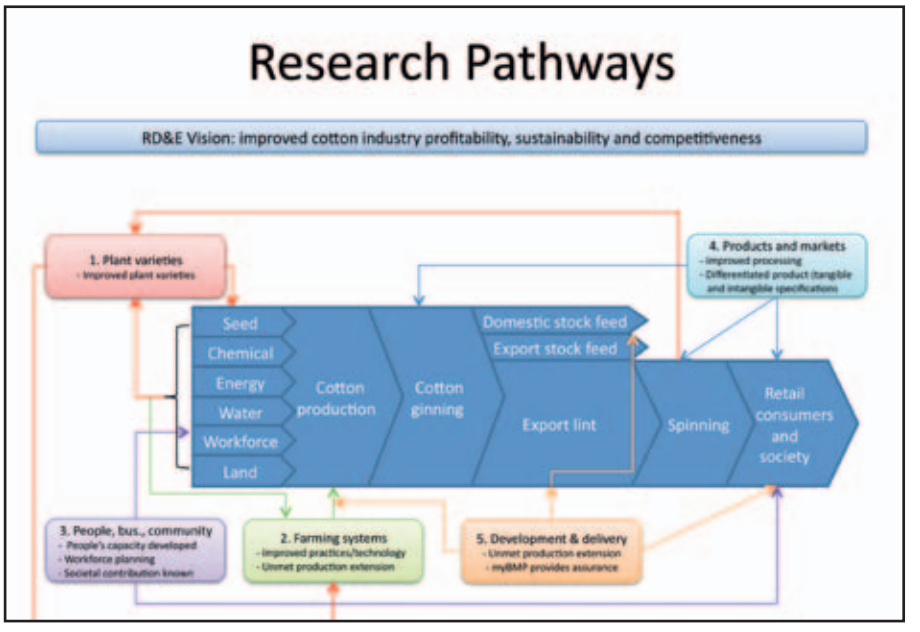
WHAT'S INVOLVED?

- A bursary of $5000 per year for the duration of the degree
- Mentoring partnerships with university faculty members and industry leaders
- Professional development workshops
- Annual industry work placements that give students first-hand exposure to modern agricultural practices, and
- Opportunities to network and gain knowledge at a range of industry events.

To be eligible for the Horizon Scholarship students must be entering their first year of university, studying a degree related to agriculture.

COTTON INNOVATION NETWORK REFLECTS ON ITS FIRST YEAR

THE COTTON INNOVATION NETWORK WAS FORMED TO HELP IMPLEMENT THE INDUSTRY'S RESEARCH, DEVELOPMENT AND EXTENSION (RD&E) STRATEGY.



As part of the Primary Industry Standing Committee's (PISC) RD&E framework, this oversight committee is a forum of senior representatives from the major cotton RD&E organisations, industry and government. The network has met quarterly for the past year to focus on the research activities in the cotton industry and build on the relationships between the various organisations. The main purpose of the Innovation Network is to enhance collaboration in forming strategy, undertaking investment, conducting cotton research and assisting its development and delivery.

Network members believe the inaugural year has been a great success – focusing on ensuring that the collective approach to cotton RD&E is clearly articulated and understood. Some key highlights for the year have been documenting the research pathways for each research priority area, mapping the current RD&E activity against these pathways and identifying the areas where industry needs to focus on improving our RD&E investment more strategically.

The aim of the network is to ensure that industry is getting the best value for its research investment and the best projects undertaken to achieve the outcomes the industry wants in the most efficient and effective way.

The past 12 months has seen all members of the network contributing to the development of the five research priorities, identified as the key areas for achieving the industry 2029 Vision. These priorities are:

- Better Plant Varieties
- Improved Farming Systems
- People Business & Community
- Product & Market Development
- Development & Delivery.

Each of these research pathways clearly identifies the RD&E purpose, the capability required to undertake the RD&E and the current timeframe, research problems, risks and benefits associated with the RD&E activities. The research pathways can be viewed in detail at the National PISC Framework website http://tinyurl.com/bezytux

Another key highlight has been the completion of the Gap Analysis of all current activities within the cotton industry's RD&E sector and mapping these activities against the five research priority areas.

The Gap Analysis was a huge task which collated the investment, activities, purpose and time horizon information of every current research projectwhich totalled 131 projects valued at $80million per annum. This information was collated and analysed so that the network could answer questions such as: Where is the effort going? What is the time horizon of the R&D Activity? Who is involved? Do projects have linkages across the research priorities and does cotton have linkages to other industry sectors' R&D efforts and when do projects end?

The results of this survey are now being analysed to identify where gaps, overlaps and linkages occur. The network members recognise that improvements will come from both individual and collective actions.

Overall the activities of the network have been extremely useful in sharing knowledge, building collaborative relationships and increasing our understanding of what each organisation contributes to the overall RD&E effort. The next 12 months will be building on the excellent work achieved so far and continuing to implement the Cotton Sector Strategy.

The Network is chaired by Juanita Hamparsum, a cotton grower who has held directorships across a range of industry, research and NRM organisations.

The Innovation Network members are:

- Cotton Australia – Greg Kauter Policy Manager – Research Direction and Stewardship
- Cotton Research and Development Corporation – Bruce Finney Executive Director
- Cotton Seed Distributors – Steve Ainsworth General Manager – Commercial Operations
- CSIRO – Dr John Manners Chief of Plant Industry
- Department of Agriculture Fisheries and Forestry – Peter Ottesen Assistant Secretary Crops, Horticulture & Wine Branch
- Queensland Department Agriculture, Fisheries and Forestry – Garry Fullelove General Manager – Crop and Food Science
- NSW Department of Primary Industries – Michael Bullen Deputy Director General
- Council of Agricultural Deans representative(s) on behalf of universities – Professor Les Copeland

More information on the Cotton Sector RD&E Strategy and Research Pathways can be found at www.npirdef.org or by contacting member representatives.

The research pathways can be viewed at http://tinyurl.com/bezytux

see our website

THE BUGILBONE RIDGE FERAL PIG CONTROL GROUP IS PRODUCING BIG BENEFITS NOT JUST FOR LOCAL COTTON PRODUCERS, BUT ALSO FOR NEIGHBOURING LANDHOLDERS AND THE ENVIRONMENT.

BUGILBONE RIDGE FARMERS TAKE A TEAM APPROACH TO TACKLING FERAL PIGS

A new collaboration between farmers, CRDC, Namoi Catchment Management Authority (CMA) and The North West Livestock Health & Pest Authority (LHPA) has developed a program to reduce feral pig numbers, protect around 13,000 hectares of natural coolibah blackbox vegetation and reduce damage to crops. The Cotton Growers Working for a Sustainable Landscape project is facilitated jointly by CRDC and Namoi CMA through the Australian Government's *Caring for our Country* initiative.

After the recent run of good seasons and regular flows in the Namoi River and local creeks, the pig population exploded. Large mobs were roaming the area, causing damage to agricultural land and in environmentally significant areas of native vegetation.

With feral pigs causing widespread problems for all landholders along the Namoi River, it seemed an obvious step to bring cotton growers, graziers and other farmers together to tackle the problem as part of a team effort.

Pilliga farmer Sam Powell is part of the Bugilbone group of 15 landholders and says pig numbers have increased dramatically. Sam says the pigs take refuge in cotton crops, particularly during the summer heat.

"Pigs like to wallow to keep cool on hot days, and we see big numbers of them out in the channels," he said.

"They wreck your channels and banks and flatten areas of the crop, tramping down the plants to make their nests, which makes a real mess of row formation."

The pigs have also acquired a taste for fresh cotton bolls. Inspection of carcases has revealed stomachs stuffed with bolls. They are also partial to chickpea and sorghum crops and prey on small native animals and young lambs. Feral pigs destroy native habitat, damage pastures and pollute stock watering holes. They also spread diseases including leptospirosis which reduces fertility in cattle herds.

As a result the large scale control project was devised, covering some 66,000 hectares along the Namoi River, of which 13,000 hectares is natural coolibah blackbox vegetation**.** The project funded an aerial shoot in December 2012, which culled 1100 pigs.

Namoi Catchment Officer, Stacey Vogel said about 60 percent of the participants were cotton growers, while the rest of the group run other farming enterprises. LHPA Pest Animal Ranger Jamie Maddocks said "The follow up baiting and trapping work carried out by landholders has been excellent.

"This has probably been one of the most successful control projects I've seen, with a very high level of landholder engagement."

Jamie praised Namoi CMA and the CRDC for getting involved.

"It's been a really useful partnership, and the combined experience and expertise of so many farmers working together will result in a better outcome for all."

Johann Oosthuizen manages Namoi Farms north of Pilliga, and was amazed at how much grain the pigs are capable of consuming.

"We had about 10 bait stations set up but there are so many pigs out there, if we had time we could probably have put out another 50 bait stations and got good results," he said.

After a week of feeding the grain was poisoned with 1080, and there was an almost immediate effect on pig numbers. Johann believes working together with other farmers is the most effective way of tackling the problem.

"If it's only you baiting, the pigs will just come in again from neighbouring properties," he said.

"There's a lot of economic benefit, getting people together has been beneficial for us as farmers and for the environment."

The partnership between industry and the Bugilbone Ridge Feral Pig Control Group has been welcomed by the growers. Both Sam Powell and Johann are hoping the team approach will continue, as "working with fellow cotton producers and other landholders regardless of their enterprise is a big advantage when trying to combat a key environmental and agricultural pest in the landscape like the feral pig".

Growers Johann Oosthuizen, Sam Powell, Lauren Wilson (Namoi CMA) and LHPA Pest Animal Ranger Jamie Maddocks at a recent 1080 bait workshop as part of the Bugilbone Ridge Feral Pig Control project and the Cotton Growers For A Sustainable Landscape project.

BELOW LEFT:
A remote sensor camera snaps feral pigs dining out at a bait station. The cameras were installed at key locations to monitor the impact of the baiting program on pig activity.

DAFF VISIT HIGHLIGHTS COTTON'S COHESIVE INDUSTRY

THE NEW SECRETARY FOR THE COMMONWEALTH DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY, ANDREW METCALFE HAS AN INTERESTING LINK TO THE WAY THE MODERN AUSTRALIAN COTTON INDUSTRY LOOKS, AS WAS DISCOVERED DURING A VISIT TO NARRABRI LATE LAST YEAR.

ABOVE RIGHT: Department of Agriculture, Fisheries and Forestry Secretary Andrew Metcalf on his visit to Narrabri last year and the portrait of his uncle Norm Thomson at the Australian Cotton Research Institute.

BELOW: DAFF Secretary Andrew Metcalfe met with CSIRO Plant Industry cotton breeders Dr Warwick Stiller (left) and Dr Greg Constable (right) as part of his visit to the industry.

CRDC hosted the secretary's comprehensive tour of cotton research, breeding, growing, ginning and classing facilities.

Andrew said he has always had a strong personal interest in rural business and grew up in Toowoomba in Queensland in a family with over a century's connection with the land. His family link to the cotton industry is not an inconsequential one – his uncle Norm Thomson is recognised as one of the greatest contributors to the industry through his plant breeding and research. Norm's portrait hangs in the reception area foyer of the Australian Cotton Research Institute (ACRI) near Narrabri.

"My uncle was an agricultural scientist who headed the CSIRO's operations at Narrabri for many years conducting research into the cotton industry," Andrew said.

"It was great to spend time at ACRI, now run by NSW DPI and CSIRO, where he worked and see some of the cotton varieties that he bred in his time there.

"The Cotton Research and Development Corporation were terrific hosts and showed me how the different parts of DAFF come together to support the cotton industry at the different stages in the development, growing and marketing cycle."

Visits to Cotton Seed Distributors, Australian Classing Services, Auscott Narrabri and ACRI showcased the co-ordination, collaboration and proactive approach to R&D the industry is known for.

The Secretary viewed small plot trials at CSD where Australia's lead in varietal development was outlined, while a visit to ACRI showcased industry research and included a discussion of the cotton industry RD&E strategy. As one of the most progressive large scale farms in the industry, Auscott Narrabri provided an ideal place to see production first hand, from farm to gin.

"DAFF is a large and unique department and that means that some businesses and products, like cotton, are touched by us many times in the journey from production to consumer," Andrew said.

"The Australian research and development sector is a major contributor to our portfolio industries and I'll be looking to ensure that we work closely with our portfolio partners to make the most of the investment in this area.

"The department is vital to the prosperity of Australia. The portfolio industries it supports has a combined value of $52.1 billion, export around 60 per cent of the country's production, and employ around 351,000 people."

As departmental secretary Andrew is also the DAFF Director of Animal and Plant Quarantine, which our industry relies heavily on to protect it from threats which could substantially hinder our industry and negatively affect our status as being free of many diseases and pests of cotton which affect other countries.

"Our management of Australia's biosecurity system keeps Australia substantially free from plant pests and diseases; we support and contribute to research and development; our policy and programs are helping to improve sustainability and improved stewardship of our land," he said.

CRDC Executive Director Bruce Finney said the visit was a tremendous opportunity for Andrew to familiarise himself with the industry upon his commencement as DAFF Secretary and "equally an opportunity for us to communicate how we are meeting the needs of government and growers in partnership with our world-class researchers".

"Andrew was very interested to know how the industry operated in regard to R&D and we look forward to continuing to demonstrate the benefits from research outcomes.

"It's about the partnership of industry and government in rural research and we need to clearly understand the government's priorities."

CRDC WELCOMES NEW INVESTMENT GENERAL MANAGER

PAULA JONES HAS BEEN APPOINTED AS BRUCE PYKE'S SUCCESSOR IN THE SENIOR ROLE OF CRDC'S GENERAL MANAGER – R&D INVESTMENT.

CRDC will farewell the 20-year veteran early next year, however the industry is lucky to have secured a very capable replacement," CRDC Executive Director Bruce Finney said.

"CRDC has always had great people working together to successfully invest in R&D that delivers benefits to cotton growers, the industry and community.

"The commitment to having a highly capable team is set to continue with Paula commencing from the beginning of this month (March)."

Paula brings extensive experience in science, leading research strategy and management having worked overseas at the University of Exeter and most recently as the Chief Operating Officer for the Cotton CRC.

She is well respected throughout the cotton industry and was awarded the Australian Cotton Industry Researcher of the Year Award in 2012. Paula is a current participant in the Australian Rural Leadership Program.

"Importantly CRDC will continue to have the ongoing support of Bruce Pyke through 2013 as he moves towards retirement in early 2014 after more than 20 years of service to CRDC and the industry," Bruce said.

After playing an extremely active role in research while at the Cotton CRC Paula was attracted to this role because she "really enjoys the opportunity to be involved in both research and the cotton industry.

"This role is a great opportunity to continue working in both and lead a great team who are committed to the industry and its future," Paula said.

"I have worked in the cotton industry for the last six years and have really enjoyed the dynamic nature of the industry and growers willingness to be involved in research.

"This is a great industry to be involved in because of the people and their enthusiasm for the industry. I am really looking forward to being able to continue working in the industry and making a contribution."

Paula said the industry has a long history of actively supporting quality research and development and in many instances has looked to industry bodies and the CRDC to help solve some of the biggest challenges.

"As new challenges and issues emerge, quality industry-supported research and development will still be important," Paula said.

"I have some big shoes to fill in terms of the great work done by Bruce Pyke in his 20 years in this role. I hope I am able to continue to build on this work and will continue to support research and development that best benefits the cotton industry."

Spotlight will profile the contribution of Bruce Pyke to R&D and the industry in coming issues.

Paula Jones has been appointed as CRDC's General Manager R&D Investment.

SCHOLARSHIPS FOR GROWERS

Cotton Australia and CRDC are offering a Nuffield Scholarship for one cotton grower this year.
CRDC and CA invest in this and other leadership and development programs to provide capacity building opportunities for individuals and the industry.
Nuffield Australia provides opportunities for Australian primary producers and managers to travel overseas on agricultural research scholarships. Scholarships are a four-month program consisting of both group and individual travel. Nuffield has been awarding scholarships for over 60 years. Scholars are people who are committed and passionate about farming, are at the leading edge of technology uptake or are potential future leaders of their industry.
There are 300 Nuffield scholars in Australia and 1250 word-wide, providing a unique agricultural network. The learning process is continues with state, national and international tours and conferences.
Applications for 2014 Scholarships open April 1 2013.
For more information go to www.nuffield.com.au

see our website

CLAIMING THE DATE

Following the success of the past three years, the Sustaining Rural Communities Conference is on again in 2013, on June 5 and 6 at Narrabri's Crossing Theatre.

This year's conference will examine the burning question of "what makes a community resilient".

CRDC is partnering with Namoi Catchment Management Authority to stage the event.

CRDC's Rohan Boehm says resilience is about dealing with change, and the great line up of community leaders and inspirational speakers have come on board to share their experience with attendees.

"These conferences are practical and have attracted people who do create change in their community. It also provides an amazing networking opportunity to connect with like-minded people," Rohan said.

To register your interest and receive e-newsletter updates, go to www.sustainingruralcommunities.org.au

see our website

BUILDING A PICTURE OF OUR INDUSTRY

THE VALUE OF INFORMATION TO INDUSTRY ABOUT ITSELF CANNOT BE UNDERESTIMATED.

When growers and consultants complete surveys for CRDC the information gathered is of enormous value for their industry.

It is valuable not just to bodies like CRDC and Cotton Australia; the way the information is used can benefit all players in the industry.

"Grower and consultant surveys are really important for us in understanding current industry practice, tracking practice change over time, as well as identifying research, development and delivery needs," says CRDC General Manager Investment, Paula Jones.

"This allows us to identify what we're doing well, what we could do better and where the research gaps and priorities lie.

"Surveys allow us to see and tell the industry's story, for example through our environmental surveys and reviews we build up a picture of our industry in that area.

"The information also allows us to ascertain where we sit globally, in for instance, yield or quality or water use efficiency.

"The information can be of interest for growers to see how their practices compare with others, not just regionally, but nationally and globally.

"Knowing how we are performing against others and benchmarking this performance whether at a grower to grower level or as an industry at an international standard allows for improvement in practice, research and innovation – which should lead to a successful farming operation."

Grower surveys are of particular importance as they canvas the views of the growers – which may differ from those of the consultants (who are surveyed annually by the CCA).

The industry-wide grower surveys from 2011, 2007, 2006, 2000 and 1997 allow the industry to track changes in industry practice. This period has seen some major change in cotton production.

In a regional sense, a comprehensive survey arranged by Central Queensland growers of the 2011-12 season has given them some detailed information about farm inputs, efficiencies and how these relate to yields and quality.

"This allows for information sharing and learning, so farms can look at how they compare to others and the regional industry can delve into the local issues," says Ingrid Roth of Roth Rural who is undertaking the 2013 Cotton Grower Survey for CRDC.

"A Cotton Grower Survey will be distributed in the June edition of *Spotlight* and we'd really appreciate growers contributing to this. It is so valuable to have good data for the industry – and without grower input this isn't possible.

"Together with the Development and Delivery team's Regional Development Officers we are planning regional meetings to work through some survey trends with growers – we think this will be interesting for growers and also help identify the local RD&E needs."

Information has been drawn from the range of available data sets to draw a picture of cotton farming practices over time.

CRDC Investment Manager Climate, Soils and Carbon, Allan Williams, has seen first-hand the value of surveys and information in discussions with both governments and retailers / brands, and sees the participation in the Grower Survey as being invaluable in demonstrating the on-ground improvements being made by growers and the commitment of the industry to always improving how cotton is produced.

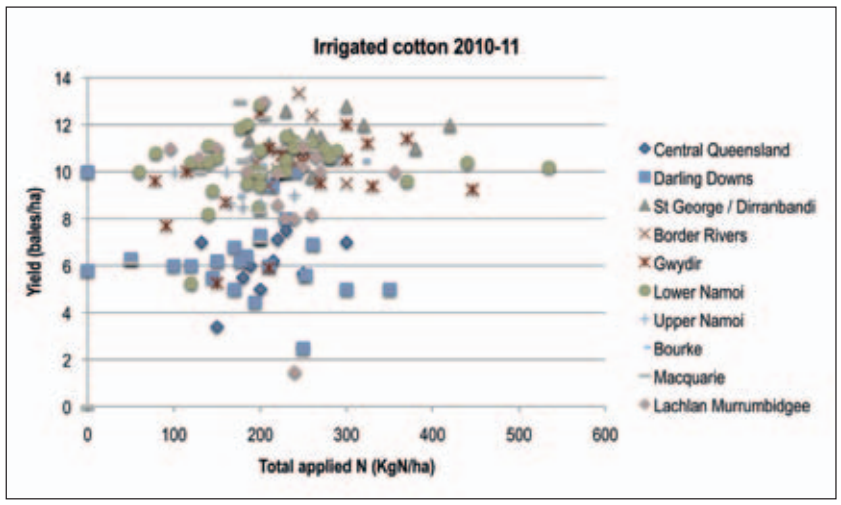
"But it's not just the ability to tell a positive story and guide research that makes good survey information valuable," says Allan.

"By understanding the range of efficiencies being achieved for a particular farming activity (for example energy use for pumping water) through benchmarking surveys, individual growers can identify the best opportunities for improving their own efficiencies."

The use of surveys has also been integral to Cotton Australia in informing its strategic direction.

CEO Adam Kay says a major survey undertaken in 2012 followed by cotton grower association meetings provided the baseline data for the new CA five-year strategic plan.

"Growers own the business and a survey lets them have a say in its direction," he said.



Surveys allow greater information sharing and learning, and at a regional level the results allow industry to delve into localised issues, shown in this graph relating yield and nitrogen application.

Surveys of the industry are undertaken to

- Measure adoption of key practices
- Monitor change over time – to justify & target RD&E investment and report on industry improvements
- **Benchmark key production efficiencies**
- Identify key issues and concerns faced by growers and industry members
- Target research and extension efforts
- Measure the impact of research and extension investments
- Market intelligence
- Specific research projects.

FERTILISER	1997	2001*	2006*	2007*	2011^ Irrigated	2011^ Dryland	Trend
Pre season nitrogen – solid fertiliser (kg N/ha)		80	87	101	142	89	↑
Pre season nitrogen – gas fertiliser (kg N/ha)		78	71	60	155	84	↑
In season nitrogen – solid fertiliser (kg N/ha)		17	29	60	99	45	↑
In season nitrogen – gas fertiliser (kg N/ha)		8	14	18	83	40	↑
In season N water applied (kgN/ha)					57	5	
TOTAL applied N kg/ha	125	176			217	96	
Pre season phosphorus fertiliser (kg P/ha)		23	30	35	42	14	↑
In season phosphorus fertiliser (kg P/ha)		2	3	2	20	13	↑
TOTAL applied P kg/ha					40	16	
Pre season potassium fertiliser (kg K/ha)		8	16	24	33	7	↑
In season potassium fertiliser (kg K/ha)		0	2	4	15	2	↑
TOTAL applied K kg/ha					28	7	
Zinc fertiliser (kg Zn/ha)		5	5	5	4.4	3.7	↔
Sulphur (kg S/ha)					6.3	2.4	
Trace elements					21	4	

* Roth G (2009) Economic, environmental and social sustainability indicators of the Australian Cotton industry. Cotton CRC.
^ GHD Hassall (2011) Cotton Grower Practices Survey. Cotton CRC and CRDC.
CCA 2010 survey questions change in NPK rates over 5 years seems to show similar trends.

Table 1 Industry-wide grower surveys allow industry to track changes in practice.