

**The Association of Australian Cotton Scientists
inaugural
Australian Cotton Research Conference**



8th - 11th September 2013

**Promoting inquiry, networking and collaboration in
the Australian cotton research community**



Welcome to delegates

Dear Delegates,

On behalf of the organizing committee I would like to welcome you to Narrabri, and to the 2013 Australian Cotton Research Conference, hosted by the Association of Australian Cotton Scientists. We have nearly 90 high caliber talks including 3 plenary presentations for you to enjoy, and about 170 participants with which to bounce around ideas.

Each of the three days of presentations has a theme: **Monday** is Breeding and Post Harvest; **Tuesday** is Agronomy, and **Wednesday** is Pest Management. There will be two concurrent sessions on each day. The aim of this approach is to help delegates gain an overall perspective of each area of cotton research and solidify that understanding. It is to this end that each day will finish with a session called the **"Devil's advocate with a glass of wine"** which will involve two "Devils", an adjudicator, wine, and you. The devils have been commissioned from our healthy pool of argumentative researchers and at least one devil will attend most talks of the day. For more information on these sessions, see Page 12.

As part of the entertainment, Harmony Inc., a community based group, will present a small section of contemporary choral music at the Welcoming Ceremony at the Crossing Theatre; Helen Conroy will present her own expression of folk-rock at the Eulah Creek Campfire dinner; and the bush band November Shorn will get everyone's foot tapping at the Conference dinner at Craigdon Guest House.

The aim of this conference is that people leave the conference feeling that they have been well looked after and refreshed. The ultimate aim is for each delegate to feel a sense of enthusiasm and vibrancy around their work.

Acknowledgments: This conference has been a team effort and I would like to thank everyone involved. In particular I am very grateful to the conference committee for all their hard work and dedication. For example, I am very thankful to David Larsen for managing and putting together the website; Lewis Wilson, Nilantha Hulugalle and Jeff Werth for reviewing the abstracts; Lewis Wilson and David Larsen for getting the program together; Robert Mensah, Steve Allen, Junji Miyazaki and Warren Conaty for undertaking numerous jobs to ensure the conference ran smoothly; Phil Armytage for liaising with CSD; and especially Yvette Cunningham for enthusiastically organizing the conference logistics. Other people not on the committee who have contributed greatly include Simone and Viliami Heimoana for running the Eulah Creek Excursion; Jody Draheim for doing the paper work associated with the conference, Jo Cain for her sage financial advice; Michael Bange and the AACS committee for their support; and Greg Constable for his counseling. I am very grateful to our sponsors, CSIRO Plant Industry, CSD, and particularly our major sponsor, the CRDC for their generous support. Without their contribution many events would not have been possible.

Best wishes,

Mary Whitehouse

(Conference Committee Chair)

Other Committee members:

Yvette Cunningham	David Larsen	Jeff Werth
Lewis Wilson	Warren Conaty	Juni Miyazaki
Steve Allen	Nilantha Hulugalle	Phil Armytage
Robert Mensah		



Welcome on behalf of the Association of Australian Cotton Scientists

Dear Delegates,

Welcome all to Narrabri the birthplace of the modern cotton industry and cotton research community. On behalf of the Association of Australian Cotton Scientists I'd like to welcome you all to our inaugural Cotton Research Conference. With the cessation of the Cotton CRC and it's Science Forum and the evolution of the Australian Cotton Conference toward broader industry issues, there was a recognised need for a gathering of scientists that would be focused on the specifics of cotton science, and which would allow all those involved in cotton research to have a forum to present their research to others. This was a great opportunity for the newly formed Association of Australian Cotton Scientists to deliver a conference which would help meet one of its key objectives of 'facilitating communication between scientists and encouraging collaboration and integration across agencies and disciplines'. I am personally excited about the breadth and quality of research being presented and look forward to catching up with new and old acquaintances.

While at the conference I would ask those who are not already members of the association to consider membership. As a united association we can begin to have a voice supporting a dynamic cotton industry that highly values our research, and its researchers. To that end in the past year we have already gained traction towards representation on key industry committees and activities, with active encouragement from CRDC and Cotton Australia. Please also consider attending our Annual General meeting after lunch on Wednesday during the conference, or come and speak to me or one of committee members on any ideas you may have for the association.

Finally, I would like to thank all the delegates for your attendance; your strong support has ensured the conference will continue to exist well into the future on the cotton calendar. Also thank you to our generous conference sponsors CRDC, CSIRO, NSW DPI, and CSD. Lastly for the efforts of Mary Whitehouse our conference chair and the conference committee for making the vision a reality, and helping cotton research across all disciplines come to light. It has been a great pleasure to witness the keen enthusiasm and collegiate effort that ensures that the ideals of the association will be realised. Enjoy the conference.

Best Regards,

Michael Bange



Program Complete

Sunday 8th September		
7:00-9:00 pm	Riverside room: Informal Welcome with finger food and Registration.	
Monday 9th September – Breeding and Post Harvest		
8:30-8:40 am	Riverside room: Tea/ Coffee available. Auditorium lobby: Registration	Page No.
8:40 – 8:55 am	Auditorium: Welcome to Country.	
8:55 – 9:00 am	Auditorium: Housekeeping.	
9:00 – 9:15 am	Auditorium: Association of Australian Cotton Scientists Welcome - Mick Bange.	
9:15 – 9:30 am	Auditorium: Innovation Network Welcome – Juanita Hamparsum.	
Monday A 9:30 –10:30 am	Auditorium: Plenary Talk Chair: Mick Bange Dr. Greg Constable; Cotton breeding: past and future; conventional and molecular; and important interactions	13
10:30-11:00 am	Riverside room: Morning Tea – Guy Roth introducing collaborative CRC work	
Monday A 11:00-12:30 pm	Auditorium: Session 1 Stream 1 (6 Talks) BREEDING: FIBRE QUALITY Convener: Robert Eveleigh	
11:00-11:15	The pattern of cell wall polysaccharide deposition in cotton seed fibres differs for different species and in different seasons. Filomena Pettolino , Dina Yulia, Danny Llewellyn.	51
11:15-11:30	Molecular regulation of secondary cell wall deposition in cotton fibres. Colleen MacMillan, Liz Brill, Liz Dennis, Danny Llewellyn.	47
11:30-11:45	Pectin methylesterase and pectin remodelling differ in the fibre walls of two <i>Gossypium</i> species with very different fibre properties. Qinxiang Liu , Mark Talbot, Danny Llewellyn.	45
11:45-12:00	Does the lignin biosynthetic pathway have a role to play in cotton fibre quality? Hannah Birke , Filomena Pettolino, Colleen MacMillan, Danny Llewellyn.	28
12:00-12:15	Breeding progress and challenge for better quality cotton grown in a high yielding production system. Shiming Liu , Greg Constable, Warwick Stiller, Peter Reid.	44
12:15-12:30	Breeding strategies for improving fibre fineness while maintaining yield. Jenny Clement , Greg Constable.	32
Monday C 11:00-12:30 pm	Cinema 1: Session 1 Stream 2 (6 Talks) NATURAL RESOURCE MANAGEMENT & MODELLING Convener: Jane Trindall	
11:00-11:15	Development of a sensing system for automated cotton fruit load and vegetation estimation. Alison McCarthy , Nigel Hancock.	47



Molecular regulation of secondary cell wall deposition in cotton fibres

Colleen MacMillan, Liz Brill, Liz Dennis, and Danny Llewellyn

CSIRO Plant Industry

Stream: *Breeding* Oral

Cotton fibres are long thin cells of the seedcoat that develop a very thick secondary cell wall (SCW) composed of almost pure cellulose that constitutes the bulk of the fibre mass. High rates of cellulose deposition within the fibre begin about 16-18 days after flower opening and continue for another 20 or more days. The SCW determines many fibre quality properties like fibre strength, elongation and maturity and the onset of SCW deposition may also terminate fibre elongation and hence affect fibre length. We are interested in how this SCW deposition is regulated at the molecular level. NACs (No apical meristem NAM, ATAF, CUC cup shaped cotyledon) are transcription factors that regulate many processes in the plant life cycle and some NACs are known to regulate the activation of secondary cell wall production in Arabidopsis, poplar, Medicago, rice, and maize stems so are good candidates for regulating fibre SCW deposition. We describe the identification of several NACs of Upland cotton, *Gossypium hirsutum*, that on the basis of their expression patterns are likely to be SCW regulators. Promoter sequences of these NACs have been determined, and at least one shown to be able to drive a reporter gene expression specifically in cells undergoing secondary cell wall synthesis, including in fibres. Such promoters may have potential applications in biotechnology to express transgenes to affect the fibre SCW.

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Development of a sensing system for automated cotton fruit load and vegetation estimation

Alison McCarthy and Nigel Hancock

National Centre for Engineering in Agriculture, University of Southern Queensland, Toowoomba, QLD

Stream: *NRM* Oral

Measurements of fruit load and vegetation indices can be useful for monitoring plant growth stages and condition and informing management decisions (e.g. irrigation volume and timing). However, these measurements are laborious to collect in broad-acre field situations. A camera-based sensing system has been developed to automatically estimate cotton fruit load and leaf area index in cotton. The system uses three cameras to capture overhead views of the crop canopy and an ultrasonic distance sensor to measure crop height. The captured images are analysed to estimate plant density, flower count and boll count, whilst the height is used to estimate the leaf area index of the crop. Three platforms have been developed to convey the sensing system over the field, two ground-based vehicle configurations (one manual, one motorised), and an overhead system which can be mounted on a centre pivot or lateral move irrigation machine. The ground-based systems were evaluated in the 2010/11, 2011/12 and 2012/13 cotton growing seasons, and the overhead-based sensor in the 2012/13 season. This paper describes the developed system and presents an evaluation of the system in cotton at different crop growth stages and lighting conditions. It is concluded that the plant height can be estimated using non-contact sensors under field conditions and plant density and flower count can be estimated from the top view images. However, the overhead cameras underestimated the boll count as the bolls were generally located lower on the plant.

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