SCIENTIFIC EXCHANGE
Final Report

Part 1 - Summary Details

Cotton Catchment Communities CRC Project Number: 5.10.10.51

Project Title: World Cotton Research Conference, Mumbai (and Cotton Technical tour, Nagpur), India, November 2011

Project Commencement Date: 4th November 2011
Project Completion Date: 15th November 2011
Research Program: The Farm

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Part 3 - Travel Report

The points below are to be used as a guideline when completing your final report.

1. **What were the:**
   a) **Major findings, outcomes and highlights.**

This report relates to my travel to attend the 5th World Cotton Research Conference in Mumbai, India (November 7-11, 2011) and the Cotton Technical tour (November 12-13, 2011), which followed the conference, to the cotton growing and processing region of Nagpur.

The conference dealt with a wide range of issues concerning the cotton industry, from seed production, plant growing and the farm to fibre quality, cotton processing and the textile industry. The opening sessions dealt with new directions in cotton production research, blending biotechnology,

research, blending biotechnology, breeding, GM crops (in particular in India), the textile chain and chemical processing of cotton. The two closing sessions dealt with an international cotton genome initiative for cotton improvement and with cotton mechanisation. One issue with mechanisation in countries where small, family owned farms produce a substantial proportion of the cotton is the small area of the farms. Another issue, in larger farms is workers becoming redundant and the possible increase in unemployment. Having the conference in Mumbai and most of the participants from India, it was only natural that the majority of the conference presentations and discussions concentrated on issues in cotton production relevant to India and the region.

In the genomic area, the majority of the presentations dealt with increasing fibre quality and with development of transgenic plants and breeding for varieties resistant to pests. Many discussions on emerging pests were concentrated on those affecting Bt-cotton in India. There is a relatively long list of the latter and they include, but not restricted to, mirid bugs and flower bud maggots.

With my area of expertise being cotton disease and soil microbiology (soil health) I have concentrated on the sessions related to the cotton plant and the farm. I was invited to give a presentation titled: *Thielaviopsis basicola*-cotton interactions leading to black root rot, as well as to chair a session on disease management, titled: Leaf curl virus management. In this report I will concentrate on the sessions I have participated in and those related to cotton disease.

Most of the presentations regarding cotton disease concentrated on the leaf curl virus episodes in India. Northern Indian cotton growers suffered great yield losses due to this virus (Gemini virus), which is transmitted by white fly. There is a lot of research done to try and understand the viral biology and virulence and there is some evidence of an ability of the virus to change and still cause severe disease.

Regarding disease management a very informative presentation was given by D. Monga of the CICR (Sirsa, India) titled: "Changing scenario of cotton diseases in India – the challenge ahead". The main message I have got from this presentation is indeed the changing nature of cotton disease, which is a reflection of evolution and variations in farming practices and cultivation, importation, use of alternative cotton varieties (including cultivation of tetraploid cotton vs diploid used in 50th, GM cotton), climate and thus geographical region (temperatures, humidity – e.g. dry cold weather vs. tropical).

Bt hybrids were shown to be susceptible to a wide range of diseases. Several Bt hybrids introduced into northern India in 2005 were found to be highly susceptible to the leaf curl virus and their use caused an outbreak of the disease with great yield loss. Currently, Bt hybrids tolerant to the viral infection are in use. The Bt-cotton hybrids have also shown relatively higher incidence of fungal foliar spots including grey mildews and bacterial leaf blight diseases (*Alternaria* blight and bacterial blight) when compared to other cotton varieties in northern India. High temperatures, relatively high humidity and long periods of exposure to sunlight were suggested to increase disease incidence. Such conditions are found in northern Australia, in the tropics, so Qld growers may benefit from the Indian experience in growing cotton under hot/humid climatic conditions. It is interesting to note that, as we know from the Australian cotton experience in NSW, several soil-borne fungal diseases, such as black root rot, are more prevalent under the opposite conditions: cool temperatures and relatively dry conditions! This is possibly the reason why the black root rot is not reported as a problem in tropical Qld.

The main observation I have made from the disease management sessions is **the dynamic nature of cotton disease**: we win one fight, we start another! A cotton variety developed to be tolerant to pests might be highly susceptible to disease; conditions that suppress root fungal diseases may enhance a range of foliar diseases; there is no one or even a combination of a few treatments that are suitable to control a wide range of diseases. Therefore, the main conclusion drawn from the above-made observations is the need to locally manage cotton disease according to the disease/s prevalent in the area and the regional environmental conditions, including biotic and abiotic parameters. There is a constant need for monitoring for pests and diseases, understanding the biology of the disease to be able to develop ways to control it and understanding the local limitations to plant growth so that disease can be minimized by promoting plant growth. The Cotton industry would thus benefit from developing an IDM (Integrated Disease Management) strategy side by side with IPM.

And the biggest conclusion – we surely do not want the leaf curl virus in Australia!

2. Detail the persons and institutions visited, giving full title, position details, location, duration of visit and purpose of visit to these people/places.

During the two-day Cotton Technical tour to Nagpur, we visited Ginning training centre, Ginning and Spinning Mills, Seed production farm (Ankur), Gin Manufacturing unit, Cotton picking and Steel industry (largest cotton ginning, pressing and delinting, machinery manufacturer), Institute for Cotton Research and interacted with cotton farmers.

The Indian cotton industry has been developing progressively in both research and industrial aspects. They have adopted the model of working closely with the farmers and designing solutions on a regional scale, as required by the farmers, in addition to increasing their overall research capacity. They are manufacturing cotton processing machinery and exporting worldwide, including to Australia.

It has been very interesting and educating to be introduced to aspects of the cotton industry I was previously not familiar with. I know the Australian cotton industry encourages their students to join field and technical tours and I am sure that supervisors and other researchers would also benefit much from understanding the overall industry they are working with.

3. **a) Are there any potential areas worth following up as a result of the travel?**

The conclusive remarks in the session I was chairing included the understanding of the dynamic nature of Cotton disease explained above and a suggestion for the development of regional IDM strategies. There was a unanimous agreement from the audience on both points and surely the Australian Cotton industry would benefit from developing such strategies. A good starting point is the continuous disease-monitoring program undertaken by DPI in NSW. A similar program runs in Qld. Educating the farmers and consultants with disease symptoms and educating the farmer regarding cotton diseases is another great initiative undertaken by the Australian cotton industry. With more research into the nature/biology of cotton pathogens, susceptibility of cotton hybrids and the biotic/abiotic regional conditions, an IDM may be developed to disadvantage the major local pathogens and enhance plant growth, reducing disease. Such a strategy should be the result of shared effort of researchers from different fields, consultants and growers.

b) Any relevance or possible impact on the Australian Cotton Industry?

From the aspect of cotton disease, the main message is the need to continue monitoring the effects of using GM cotton and understanding regional (geographical, climatic) constrains and benefits to growing different cotton varieties. Fields should be constantly monitored for early detection of current and emerging diseases due to the dynamic nature of cotton disease.

4. **How do you intend to share the knowledge you have gained with other people in the cotton industry?**

Through participating and presenting in Cotton science forums and conferences as well as using the knowledge gained when developing research projects for the Cotton Industry and supervising students.

5. Executive summary. Provide a one paragraph summary of the scientific exchange, suitable for posting on the Cotton CRC web site.

Cotton disease is highly dynamic and thus presents a constant challenge to growers and researchers. It reflects the evolution and variations in farming practices and cultivation, alternation in cotton varieties and differences in environmental parameters in various cotton growing regions (temperatures, sunlight, relative humidity, soil biotic and abiotic characteristics, pathogen presence and virulence). The main consequence of the changing nature of cotton disease is the constant challenge it creates: winning one fight starts another! GM cotton developed to be tolerant to pests (e.g. Bt cotton) might be highly susceptible to disease; conditions that suppress root fungal diseases may enhance a range of foliar diseases; there is no one or even a combination of a few treatments that are suitable to control a wide range of diseases. Therefore, there is a need to locally manage cotton disease according to the disease/s prevalent in the area and the regional environmental conditions, including biotic and abiotic parameters. There is a constant need for monitoring for pests and diseases, understanding the biology of the disease to be able to develop ways to control it and understanding the local limitations to plant growth so that disease can be minimized by promoting plant growth. The Cotton industry would benefit from developing an IDM (Integrated Disease Management) strategy side by side with IPM.