**TRAVEL, CONFERENCE or SCIENTIFIC EXCHANGE REPORT 2018**

**Part 1 - Summary Details**

*Please use your TAB key to complete Parts 1 & 2.*

**CRDC Project Number:** **CRDC1914**

**Project Title:** **"Travel: 10th Australasian Soilborne Diseases Symposium (ASDS) Brendon Warnock**

**Project Commencement Date:** **4/9/18** **Project Completion Date: 27/9/18**

**CRDC Research Program:** **1 Farmers**

**Part 2 – Contact Details**

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On the 16th of August 2018 I was contacted by Susan Maas from Cotton Research and Development Corporation (CRDC) asking if I would be interested in attending the Australasian Soilborne Diseases Symposium (ASDS) in Adelaide in a couple of weeks. I quickly checked for any prior commitments and jumped at the opportunity. Over the past couple of years I have been on a mission to better understand soilborne diseases so I was excited to learn from some of the world's best researchers.

ASDS has a unique format bringing together plant pathologists, microbiologists, farming systems and biosecurity researchers. Many researchers attending have dedicated their entire career to soilborne diseases while others have only just attained their qualifications.

### Key messages

The most important message from the symposium was about complex and dynamic interactions. Interactions between host, pathogen and environment are what determine the economic impact of disease. In this report I try to highlight some key messages in these areas.

### Host

Breeding for resistance (not tolerance) is one of the most important investments an industry can make and should be a continuous process. Breeders can challenge new varieties in a number of ways to select individuals that can effectively resist pathogens when they are present. Dr Rodrigo Mendes from the Brazilian Agricultural Research Corporation indicated that one way resistant genotypes restrict pathogen infection is by shifting their microbiome composition. This resistance strategy may be present in wild or ancient cotton relatives. If the genes responsible could be identified, markers could be developed to assist the selection process.

Root growth characteristics should also be an important criteria when selecting new varieties. The plants ability to rapidly grow roots both horizontally and vertically and for them to be colonised by favourable biology could indicate an ability to mitigate stress. The host plant's ability to cope with stress is important in determining the likelihood of infection and the quantity of economic damage imposed by disease.

Inoculating planting seed with beneficial bacteria could provide protection from seedling diseases. Steve Barnett from the South Australian Research and Development Institute (SARDI) outlined the process undertaken to identify and assess the effect of coating wheat seed with beneficial bacteria in fields with high risk of Rhizoctonia root rot. This trial indicated the potential to reduce infection by up to 38% and increase yield by 4%. This technique could be appropriate for reducing black root rot in cotton.

### Pathogen(s)

Often when symptoms are evident a complex of pathogens are responsible. It is important to characterise disease not only by what is in the plant but also by what is in the soil. The potential complex in cotton soils include Verticillium, Fusarium, Nematodes, Charcoal rot, Rhizoctonia and many others. The cotton industry may benefit from developing an understanding of the complex interactions of pathogens in cotton soils and how they impact disease severity.

Research conducted Dr Maria del Mar Jimenez Gasco at Penn State University in America indicated that studying Verticillium by means of Vegetative Compatibility Groups (VCG's) can be problematic because of the variation within them. This extremely detailed study indicated that when new epidemics occur it is often due to the emergence of previously undetected VCG's. New VCG's can be brought in in contaminated plant material or can be locally created through the process of recombination. These recombinants can invade new hosts, are highly fit and are typically highly virulent. Collaboration between Dr Gasco and Australian Verticillium researchers could be beneficial in continuing to better understand and describe strains present here now and into the future.

Research into better understanding pathogen lifecycles should be a priority. Examination of pathogen lifecycles could uncover opportunities for intervention. Jim Germida from the University of Saskatchewan examined Aphanomyces Euteiches, which infects field peas in Western Canada. His research indicates that by inoculating the seed with certain bacteria, infection of the host can be prevented. This approach could be appropriate for some cotton diseases.

### Environment

Development of cotton soil health characterisation techniques should also be a priority. It is possible to efficiently describe diversity and proportionality of microbes in a soil sample through DNA testing. The results of these tests can inform growers about changes in soil health over time and help inform decisions in farming systems adaptation. Soil health tests could become as common in the future as soil nutrient tests are today. Collaboration with Alan McKay and Kathrine Linsell both from SARDI could be a pathway to developing these techniques.

Improving soil health should be a priority for all cotton growers. Research indicates that by moving soils to a more disease suppressive state, growers benefit in a number of ways. Disease suppressive soils require less fertiliser inputs, are more resilient to insect infestations, have higher moisture holding capacity and have higher yields. Soil amendments that are high in Carbon such as seed meals, compost and manures have proven to be beneficial especially when coupled with crop rotation and reduced tillage. Widespread adoption of “soil wealth” concepts would be beneficial to the industry.

### Recommendations

I believe that soilborne disease research should be elevated to a prominent position in CRDC’s funding decisions. To this end I believe that a standalone soilborne diseases panel be formed to identify, prioritise and coordinate soilborne disease research into the future. Cross disciplinary research teams could use the techniques utilised in other industries to fast track research priorities and quickly extend the findings to growers.

Extension of knowledge to growers should also be a priority. Demonstration sites, master classes including growers, consultants and researchers and economic analysis have helped encourage adoption in other industries. There has also been an increase in farm gate biosecurity apathy that needs to be addressed.