Australian Government
Cotton Research and Development Corporation

TRAVEL, CONFERENCE or SCIENTIFIC EXCHANGE REPORT 2016

Part 1 - Summary Details

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

CRDC Project Number: ANU 1702

Project Title: Conference for ASA & SSCS Phoenix Arizona,

Project Commencement Date: 3/11/2016 **Project Completion Date:** 17/11/2016

CRDC Research Program: 4 People

Part 2 – Contact Details

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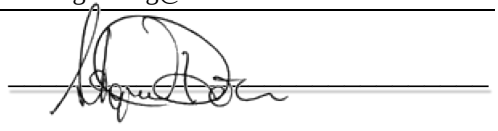
Signature of Research Provider Representative: 

Date Submitted: 22/11/2016

Part 3 – Travel, Conference or Scientific Exchange Report

(Maximum two pages)

1) A brief description of the purpose of the travel.

Attend and present a paper at joint conference of American Societies of Agronomy, Soil Science and Crop Science at Phoenix, Arizona, USA (https://www.acsmeetings.org) (2) Meet with University of Arizona and USDA-ARS staff (Maricopa Research Centre) conducting research on alternative sources of irrigation water and cotton farming systems in saline and sodic soils. (3) On returning, update USQ researchers on current research on using wastewater for irrigation.

The travel undertaken consisted of (a) Pre-conference tours on regional pedology (4-5 November 2016) and irrigated cropping systems of central Arizona (6 November 2016). (b) Attend and present paper at the international joint conference of the American Societies of Agronomy, Soil Science and Crop science. Approximately 4000 oral and poster papers were presented at the conference which was attended by around 6000 delegates. (c) Visit Arid Lands Research Centre of the University of Arizona and the USDA Agricultural Research Service. I was hosted by Dr. Clinton Williams, soil scientist at the centre. Dr. Williams' research focusses on issues related to saline water and effluent irrigation. (d) Visit to University of Southern Queensland for discussions with Dr. Jon Bennet and Aditiya Dang.

2) What were the:

a) major findings and outcomes

i) Management of saline water is focussed on using the appropriate leaching fraction rather then calcium-based amendments such as gypsum to minimise soil salinization and sodification. The fact that much of the irrigated soils in the USA are dominated by coarse textured soils such as Alfisols, Aridisols, Entisols and Inceptisols makes this easier. It was unfortunate that there were few delegates from regions where irrigation of Vertisols was common. Nonetheless, given that there is an interest in Australia on re-using saline mine water, the fact that leaching requirement is not used as a management practice in Australian cotton soils needs to be addressed. Even with water of low salinity, salinization can occur under conditions of high evaporation and low rainfall. In my view, this is largely an extension issue as much of the relevant research has been conducted.

ii) Limited research on rotation crops (e.g. barley) that can take up sodium from soil has been conducted and appears to be successful. The Maricopa centre is also conducting research on guayule (*Parthenium argentatum* L.), a flowering shrub native to the SW USA and northern Mexico that provides an alternate source of runner latex that is also hypoallergenic, unlike the normal *Hevea* rubber. It is very drought-tolerant and thrives in saline and sodic soils.

iii) Soil sodicity in calcareous soils can be ameliorated by applying small amounts of sulphuric acid with irrigation water in drip-irrigated systems. The mechanism involves solubilisation of native lime by the acid in the water, followed by replacement of exchangeable Na with the Ca released in to the soil solution. In addition to safety issues, the efficacy of this practice under furrow irrigation is low. Other products considered include gypsum and calcium bentonite.

iv) Tertiary treated effluent (Arizona) and wastewater from meat processing plants (Kansas) are used for irrigation and less widely for consumption. They are also used to recharge groundwater. The process involves creating an artificial wetland over layers of sediments of varying coarseness and chemistry. The nutrients in the effluent are taken up by the wetland vegetation whereas the water is purified through a combination of microbiological and chemical reactions as it passes through the wetland and the sediments. The purified water is then re-used when riverine supplies of water become scarce. The wetlands also have a recreational value and under drought conditions, a source of fodder for livestock. Although wetlands have been assessed in the past with respect to purifying agrochemical in irrigation water, their potential in revitalising aquifers has received little attention in Australian cotton farming systems. This may be a potential research activity in the wetlands created by some cotton growers (e.g. Auscott Warren).

v) Treated effluent originating from urban areas can be a source of antibiotics and anti-microbials (e.g. neo-aromatics in detergents that do not contain P). Due to their recalcitrance and ability to be adsorbed on to colloidal particles, some of these can find their way in to the human food chain, particularly when used for irrigating leafy vegetables. Dr. Williams has a significant research effort directed towards their identification and management with microbiological and chemical methods.

He also indicated that he would be interested in collaboration with anyone who is conducting similar research in t4h Australian cotton industry.

b) other highlights

i) The soil health partnership (http://soilhealthpartnership.org/index.html) is a farmer-led initiative of the National Corn Growers Association that brings together diverse partner organizations including federal agencies, universities and environmental groups to work toward the goal of improving soil health. They have a demonstration site network of 65 farmers across the US Midwest testing practices that can improve soil health, including: reduced tillage, advanced nutrient management and cover crops that measure and communicate the economic and environmental benefits of different soil management strategies, and provide a set of regionally specific, data- driven recommendations that farmers can use to improve the productivity and sustainability of their farms. The farmers volunteer their farms and suggest the practice(s) to be studied. Data collected is very detailed and includes management practices, inputs and outputs as well as parameters of soil, water and crop growth. The sites are run for at least a decade. Cottoninfo network staff may be interested in such a model.

ii) Threshold salinity (ECe) for juvenile cotton in a clay loam from Texas was reported to be 2.8 dS/m, and is similar to the value of 2.1 dS/m found in clayey Vertisols in my research. Both values differ from the tabulated value of 7.1 dS/m reported in many manuals and extension publications.

iii) I presented one oral paper during the conference, and a seminar on long-term data from cotton cropping systems experiments at ACRI.

2) Detail the persons and institutions visited, giving full title, position details, location, duration of visit and purpose of visit to these people/places. (NB:- Please provide full names of institutions, not just acronyms.)

Drs. **Clinton Williams** (Soil Scientist), **Kevin Bronson** (Research Leader and leader of tour on irrigated cropping systems of Arizona, 6 November 2016) and **Doug Hunsaker** (Agricultural Engineer), Agricultural Research Service/United States Dept. of Agriculture and University of Arizona, Arid-Land Agricultural Research Centre, Maricopa, Arizona (www.ars.usda.gov/pacific-west-area/maricopa-az/us-arid-land-agricultural-research-center/). Visited the centre on 9 November 2016. A seminar was given on Australian cotton farming systems and results from a long-term experiment at ACRI.

Dr. **Maxine Levin**, US Soil Conservation Service, leader of tour on regional soil pedology on 4-5 November 2016.

Other sites visited (4-5 November 2016) included numerous soil profiles around Tucson, where discussions were held on their origin and management; American Smelting And Refining Company, Sahuarita, south of Tucson (www.asarco.com); Walnut Gulch Experimental Watershed, Tombstone, south of Tucson (http://snre.arizona.edu/facilities/wgew); Sweetwater wetlands, Tucson (www.tucsonaz.gov/water/sweetwater-wetlands); and Biosphere 2, north of Tucson (http://biosphere2.org).

Dr. John Bennet and Ms. Aditi Dang at the National Centre for Agricultural Engineering, University of Southern Queensland, Toowoomba, to review papers presented at the conference and to discuss their research on saline water irrigation. I was also given a tour of their soil lab by **Dr, Alla Marchuk**. The lab is a state of the art facility for soil research.

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

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

Key issues for the Australian Cotton Industry that may be worthwhile following up are: (1) Using a leaching fraction when irrigating with saline water; (2) Using waste water to recharge groundwater; (3) Antibiotics and other contaminants in treated sewage effluent and mine waste water; (4) Assessing the Soil Health Partnership model for potential application in the Australian Cotton Industry.

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

Article for the "Australian Cottongrower". Personal communication with researchers conducting research in the same area.

6. Please list expenditure incurred. ***(Double click inside the table to enter the data)***

		Amount		
25/05/2016				
24/05/2016				
9/08/2016				
9/08/2016				
9/08/2016				

All costs have been converted into $Aus. Note that expenses not covered by the travel grant of $3000 were not included in the above table.

Please email your report 30 days after travel/conference to: research@crdc.com.au