



FINAL REPORT 2015

For Public Release

Part 1 - Summary Details

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

CRDC Project Number: CSE 1305

Project Title: Developing education capacity in the Australian Cotton Industry

Project Commencement Date: 1/7/2012 **Project Completion Date:** 30/6/2015

CRDC Research Program: 4 People

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Background to the project

In 2008 the Cotton CRC invested in an Education Officer, Trudy Staines, for 5 years to promote science and agriculture in schools. The schools program was developed to enhance and expand the science and environmental management syllabus in primary and high schools by providing relevant cotton information and opportunities for practical on-farm activities. The strategy proposed by the Cotton CRC was the promotion of science and agriculture in schools to encourage school students into careers in science and agriculture, specifically the cotton industry through collaborations with school teachers, scientists, the cotton extension teams, industry, catchment and government education agencies, to encourage primary and secondary school students to develop resources and implement science and agricultural based activities that engage students and ultimately promote the cotton industry as an employee's career of choice.

The three year project reported herein is the continuation of that initial project directly with the CRDC. As in her previous role as Education Officer, Trudy continued to be employed by CSIRO based at the Australian Cotton Research Institute, Narrabri. This facilitated continued direct connections with the industry, schools and rural communities. There was a shift in the current project to include a new initiative to better connect university graduates with potential employers in the cotton industry.

In the first two years of the project Trudy was allocated 60% to the project. In the third year of the project Trudy's input increased from 60% to 100% primarily to include a new milestone that involved working with Mr Gordon Stone (Gordon Stone and Associates Pty Ltd) to establish contacts with the cotton industry agribusiness sector. Mr Stone's CRDC funded project (GSA1501: Cotton Professional Personnel Program) was to survey agribusiness requirements for workforce development, and Trudy was to match suitable students (undergraduates from the Horizon scholarship program, the PICSE Internship program and postgraduates) with agribusiness employers. This new initiative involved trialling strategies for placements that vary in length and style of employment (short intensive terms, longer casual engagements, etc), and the way the employer contributes to the scheme (in-kind, financial, etc).

Objectives

The objectives of this project were to:

a. Become the central point of contact for industry education.

- i) Establish a project Steering Committee with representatives from CRDC, Cotton Australia, CSIRO, and others as determined.

This objective was partially completed. Initially there was a significant delay in employing a full time Primary Industry Centre for Science Education (PICSE) Science Education Officer (SEO) who was intended to be a key member of the committee. By the time that person was appointed an informal collaboration was in place that ensured relationships were maintained with key people throughout the industry leading education initiatives and this was continued instead of developing a formal committee.

b. Support the continued development of existing industry education initiatives.

- i) Lead and manage the Enviro stories competition

This objective was fully completed with the publication and presentation of student books for the last three years. The books have been made available on line and through an App store.

- ii) Liaise with CSIRO Materials Science & Engineering's Rene Van Der Sluijs to coordinate the continued delivery of the Field to Fabric Schools Course to schools in Cotton regions.

This objective was fully completed. I liaised and coordinated with Rene Van Der Sluijs to develop and present the schools Field to Fabric course as planned.

c. Actively engaging with the PICSE.

This objective was fully completed. As reported below I contributed to a number of PICSE events.

d. Represent the cotton industry in numerous education initiatives.

- i) Representing and hosting education activities on behalf of the industry.

This objective was fully completed. My representation ranged from attending educational activities, hosting school visits and engaging in education meetings and forums.

- ii) Supporting Cotton Grower Association (CGA) education activities.

This objective was partially completed as few opportunities existed to work with the CGA. I did assist in supplying resources and information when needed.

- iii) Build opportunities to coordinate education activities with the new Cotton Australia Education Coordinator.

This objective was fully completed. I developed a good working relationship with Miss Sophie Davidson from Cotton Australia and the Namoi Valley regional manager Mr Paul Sloman and together we coordinated numerous activities.

e. Support undergraduate programmes.

- i) Maintain the Summer Scholarship program

This objective was partially achieved as after the first year of the project the CRDC took the responsibility for maintaining the summer scholarship program.

- ii) Support the Horizon Scholarship

This objective was fully completed. I attended the Horizon Scholarship summits and dinners to meet scholars and arranged work placements for them in cotton businesses.

f. Support the post graduate program.

- i) Coordinate and deliver educational interactions for post graduate program

This objective was partially completed in that I helped co-ordinate and deliver and inaugural program. However, rather than hold it annually, it was agreed that holding a PhD tour every second or third year would be adequate to capture all students.

g. Work Force Development Support Gordon Stone Project.

- i) Liaise with cotton Industry Agribusinesses to set up a student organisation network

This objective was fully completed. See also reports for Mr Gordon Stone's project GSA1501.

Methods

To effectively deliver this project, a number of approaches were used. The framework and methodology for delivery included:

- Acting as the industry contact point based at ACRI for education related matters.
- Coordinating visits to industry facilities and other centres.
- Facilitating interactions with schools and universities in cotton communities and nearby towns.
- Supporting the development of education resources.
- Arranging events that promoted education activities to the industry and community.
- Supporting the establishment of other industry education projects (e.g. Horizon, PICSE).
- Working collaboratively with other industry educational initiatives and staff.
- Placing university students with agribusinesses.

Students were targeted and engaged with the ultimate aim to encourage them into science and agricultural careers, especially the cotton industry which offers a wide range of career opportunities. By offering them an awareness of the opportunities, they then can further their career via two pathways: (1) through the academic line to university and then hopefully onto post graduate studies if they are interested in being a researcher or (2) they can choose a path via traineeships and apprenticeships.

Results

a. Become the central point of contact for industry education.

- i. Establish a project Steering Committee with representatives from CRDC, Cotton Australia, CSIRO, and others as determined.

Although I have not formally established a steering committee I am constantly working closely and in conjunction with representatives from CRDC, Cotton Australia (CA), CSIRO and PICSE to coordinate project events.

I collaborate with Cotton Australia's Education Coordinator and the PICSE Cotton SEO to determine who will attend and present at forums, workshops, conferences. These included the Moo Baa Lunch Toowoomba 2013, 2014, Cotton Conferences 2012, 2014, Conasta Conferences 2012, 2013, 2014; metropolitan and regional school events, expos, workshops, and tours.

b. Support the continued development of existing industry education initiatives.

i. Lead and manage the Enviro stories competition

The Enviro Stories competition run in conjunction with Peek designs, the CRDC, North Western Local Lands Service (NWLLS) and the Northern Tablelands Local Lands Service (NTLLS), is a program designed for students to write a story on an environmental theme and have the opportunity to have it published. It works on the pedagogy of kids teaching kids.

Table 1 summarises the participation data in this program from 2008 to 2014. Students can enter an individual story or a class story; hence the number of entries may differ from the number of actual participants. The three year competition from 2012 to 2014 saw 34 schools participate with a total of 472 stories entered from 579 participant authors. There were a consistently higher percentage of participants submitting entries during the life of this 3 year project compared to previous years (see "% impact" in Table 1). This may reflect the momentum gained by this popular competition which covers not only literacy but also science, technology and mathematics and schools. Since this competition was initiated many schools have included it in their curriculum program. The Enviro Stories competition continues to be an efficient way to interact with schools across cotton and non-cotton communities.

The 2014 Enviro Stories student books have been made available on line and through the App store: <http://www.envirostories.com.au/media-farming-families-stories/>

Table 1: Enviro Stories competition from 2008 to 2014

Year	Topic	No. entries	No. students participating	% impact	No. catchments	No. NSW schools	No. QLD schools
2008	Bugs, Beetles, Bats & Birds	83	128	64	4	3	2
2009	Creepy Crawlies- Life Underground	300	355	85	5	14	4
2010	Fur & Fins, Feet & Beaks	244	353	69	4	7	5
2011	An Aussie Bush Tale	226	343	65	7	9	5
2012	Our Farmers, Our Future	196	236	83	8	14	4
2013	Save Our Species	114	150	76	5	6	1
2014	Farming Families	162	193	84	4	8	1
Totals		1325	1758	75	37	61	22

- ii. Liaise with CSIRO Materials Science & Engineering's Rene Van Der Sluijs to coordinate the continued delivery of the Field to Fabric Schools Course to schools in Cotton regions.

The course was delivered across three cotton growing regions in NSW and QLD. Table 2 shows the accumulated totals of participation since the 2008 inception of the Schools Field to Fabric course. Students who participated came from science, agricultural, biology and geography classes. During the life of this project (2012-14) the course had 115 student participants, and 23 teacher participants. Of the 107 evaluation responses, 66 (62%) rated the course as "excellent" and 39 (36%) as "good" (there was one response for "average" and one for "other"); 62 (58%) rated the course as very useful and 44 (41%) as useful. The major strengths of the course were reported as its use of demonstrations, hands on practical and outside activities and presentations with knowledgeable and experienced presenters. The presenters included Rene Van Der Sluijs CSIRO Material Science and Engineering, Geoff Dunlop Harvesting Contractor, Dr Nicola Cottee CSIRO Agricultural Flagship, Mr Alex North Cotton Seed Distributors and Ms Trudy Staines. The course has links to the curriculum in science, agriculture, technology and geography. It also offers an awareness of the career opportunities available within the cotton industry.

Table 2: Field to Fabric course

Year	Students	Teachers	Schools	Catchments
2008	21	5	3	1
2010	20	3	3	2
2011	42	7	4	2
2012	25	3	3	2
2013	76	17	5	3
2014	14	3	1	1
Totals	198	38	19	11

c. Actively engaging with PISCE

I supported the PICSE program by introducing the PICSE National Program Manager Mrs Kay Lembo and the newly appointed PICSE Cotton SEO Mrs Carissa Anderson to key stakeholders in the Cotton Industry at the Australian Cotton Conference held in August 2014 and with a tour of the Australian Cotton Research Institute (ACRI). More generally, I collaborated with PICSE to organise yearly events and activities including the Tamworth Careers Expo, University of New England (UNE) Farming Futures Careers Fair and dinner, Conasta Conference and workshop in Adelaide, school visits, industry placement camp, industry placements, undergrad internship program, teacher professional development tour.

The main PICSE Cotton event I organised is the Science and Engineering Investigation Awards (SEIA) where students have the opportunity to conduct their own science investigation experiment and present it to the local science community for judging and the possibility of winning monetary prizes. Table 3 shows that over the three years of this project (2012-14) there were 173 entries (56 primary school classes and 117 individual high school entries) from a total of 1,353 student participants across 3 primary schools and 2 high schools. The total sponsorship delivered to winning investigations was \$6,975. Engagement was significantly higher than in previous years due to the momentum of the competition and the engagement of more schools especially the smaller remote schools in the region.

Table 3: PICSE SEIA's since its inception in 2009

Year	Awards	Total No. Participants	No. Entries by School Type		No. Schools Involved	
			Primary	High	Primary	High
2009	donated prizes	313	23	0	2	0
2010	donated prizes	207	8	16	1	1
2011	\$1,450	344	14	13	1	2
2012	\$2,050	371	16	19	2	2
2013	\$1,650	484	18	44	2	2
2014	\$3,275	498	22	54	3	2
Totals	\$8,425	2217	391	146	11	9

I assisted the PICSE cotton and PICSE USQ SEO's in coordinating and running the PICSE Cotton Camp at The University of Southern Queensland (USQ) Toowoomba from 1-5 December 2014. The camp comprised 21 students from 4 NSW schools and 4 Queensland schools. The students spent five days visiting science and agricultural facilities in and around the Toowoomba region and conducted hands on practicals. They then spent five days on an actual placement within a chosen science and agricultural industry. I assisted in coordinating and organising the industry placements for students. I was also able to showcase to the students the vast opportunities associated with the cotton Industry. See Appendices 1 and 2 for student reports.

I continued to coordinate PICSE activities relating to cotton including attending annual PICSE forums and presenting activity centre updates in conjunction with Mrs Anderson at forums. I participate in bi-monthly teleconferences and send updates on progress in cotton each week by email to the PISCE wide e-distribution list.

d. Represent the cotton industry in numerous education initiatives.

- i) Representing and hosting education activities on behalf of the industry.

Table 4 lists the major events that I hosted, organised, attended and contributed to during the life of this project.

I coordinated and organised the placement of 10 high school student work experience placements, as well as over 33 tours and visits to the Australian Cotton Research Institute (ACRI) for schools, universities, community groups, post grads and other agricultural industries. I conducted over 17 hands on workshops and visits to schools across 7 valleys liaising with research staff, growers and cotton industry representatives to deliver informative, hands-on presentations to students that covered the role of research in cotton production and contributed to their curriculum. I attended 13 presentations to deliver awards and certificates to students both in primary and high school at assemblies and presentation evenings. I attended 9 careers expos, skills days and university careers fairs where I organised members from PICSE, the Crop Consultants Association (CCA), Cotton Growers Services (CGS), Cotton Australia and the Cotton Info team to speak to high school students and undergraduates on the number of cotton career opportunities available and the programs we have such as internships, scholarship etc.

Table 4: Summary of Activities

	Year	No:	Activity	Location
<i>Conferences /Forums</i>				
PICSE SEO Forums	2013-2014	4	Presented	Tasmania, Toowoomba, Canberra, Adelaide
PICSE Conasta Conferences	2012-2014	3	Presented	Canberra, Melbourne, Adelaide
PICSE Camp	2014	1	Presented	Toowoomba
Cotton Conference	2012, 2014	2	Presented	Gold Coast
Science Forums SRC	2013	1	Participated	Narrabri
AACS	2014	1	Participated	Narrabri
Cotton Collective	2013	1	Participated	Narrabri
Cotton Info	2012-2014	3	Participated	Brisbane, Sydney, Sydney
Horizon Summit	2013 -2015	3	Participated	Canberra, Canberra, Armidale
<i>Major Display/ Events</i>				
Science Unleashed	2012	1	Presented	Narrabri
Campervan & Motor Home Show	2013	1	Presented	Narrabri
Wee Waa Show Society Daft Punk	2013	1	Presented	Wee Waa
Schools Science Day	2013, 2015	3	Facilitated	Narrabri
PICSE SEIA's	2012-2014	4	Facilitated	Narrabri, Armidale
<i>Tours/ Visits</i>				
School Tours	2012-2015	14	Conducted	ACRI
TAFE Students	2012-2015	1	Conducted	ACRI
Bingara Central School Annual	2012-2015	2	Conducted	ACRI
Grafton High School Annual	2012-2015	2	Conducted	ACRI
Calrossy Anglican Girls School Annual	2012-2015	4	Conducted	ACRI
Kempsey High School Annual	2012-2015	2	Conducted	ACRI
Campervan & Motor Home Show	2013	1	Conducted	ACRI
Cotton Australia Young Farming Champions	2013	1	Conducted	ACRI
CRDC PhD Tour	2014	1	Conducted	ACRI
Maryborough Sugar Group	2014	1	Conducted	ACRI
Narrabri Community Men's Group	2014	1	Conducted	ACRI
PICSE/ UNE Teacher Pd Tour	2014	1	Conducted	ACRI
Total Students	2014	1	Conducted	ACRI
Narrabri Probus	2015	1	Conducted	ACRI
<i>Workshops/ School Visits</i>				
Schools	2012-2014	17	Presented	Various
<i>Work Experience</i>				
High School Students	2012-2015	10	Facilitated	Various
<i>Meetings (major)</i>	2012-2015	7	Attended	Various

I represented the CRDC and CSIRO at over 7 major meeting events including the workforce capacity meeting and the ABARES regional conference in Tamworth. I also attended the Horizon Scholarship workshops and dinners from 2012 to 2015 which included a visit to Parliament House in Canberra with the students to meet ministers. I presented at the Australian Cotton Conferences 2012 and 2014, and at the PICSE SEO forums from 2012 to 2014 and attended science forums like the Sustaining Rural Communities (SRC) and the Australia Association of Cotton Scientist (AACS).

I collaborated with Dr Karen Kirkby NSW DPI on a joint Sustaining Rural Communities (SRC) bursary “Careers by kids for kids”. This pilot project aimed to engage students from Year 10 at Narrabri High School to participate in making a short video outlining the careers of, for example, a Technical Assistant, Technical Officer and a Researcher. The students researched the different careers through interviews and discussions. The students then worked as a team role playing, interviewing, filming, and editing the movie and preparing it for publishing. In conducting our initial visit to the school 36 students gave names for 20 placements. The selected students had four visits to the research station and met with the Pathology team and other collaborators.

In collaboration with other key industry organisations we conducted 8 major science events and displays including the PICSE SEIA’s for 2012 to 2014 and the Campervan and Motor Home Rally which saw over a 1000 people attend and the Wee Waa Show Society Daft Punk release. These events allowed us to show case our industry and distribute information on issues of community concern.

ii) Supporting Cotton Grower Association (CGA) education activities.

There were few opportunities to actively engage with the CGA however I offered support with resources and information when requested. I coordinated with the Crop Consultant Association (CCA) to attend the UNE Farming Futures Careers Fair where Dallas King represented the CCA on our Australian Cotton Industry stand along with a member of the Cotton Growers Service (CGA) team to talk to undergraduate students on cotton careers.

iii) Build opportunities to coordinate education activities with the new Cotton Australia Education Coordinator.

I continued to share resources and information regarding our activities with the Cotton Australia education coordinator. We maximised our exposure by coordinating our activities, with CA attending metropolitan requests while I attend regional events. I established a working relationship with the new Cotton Australia area manager of the Namoi region. We worked together on a number of projects including the Gunnedah South Public School Science Week Festival and the Smalls Schools Science day at Narrabri.

e. Support undergraduate programmes.

i) Maintain the Summer Scholarship program.

CRDC took over the responsibility of maintaining the summer scholarship program. I focussed on providing support to CRDC and CSIRO funded Summer Scholarship students based at the Australian Cotton Research Institute. I helped CRDC summer scholars Sharna Holman and Johanna Nielsen and CSIRO’s Cassie Murphy, Demi Gamble and Susan Macolino with any field and laboratory based enquiries, assisted them with practical advice, motivation and moral support. I also offered perspective and career guidance.

ii) Support the Horizon Scholarship

I liaised with the Research Manager from the Rural Industries Research & Development Corporation (RIRDC) to place students for 10 days with suitable hosts. The feedback from this program was consistently good. Some examples are:

“..... my week with the team at Auscott was fantastic. I really enjoyed getting a 1st hand glimpse on the industry and was lucky enough to see all aspects including plant production, a tour of the gin and also the marketing side of things. Over all I had an awesome week and can see myself having a career involved in the cotton industry!!” **Charlie French (student)**

“I have finished my placement. The Wannon’s were fantastic!! I went out with an agronomist for a day which I thoroughly enjoyed. They definitely have given me a strong base. They did everything they could to teach me!” **Jessica Fitzpatrick (student)**

‘It is most unusual to find students interested in soils; this is something that needs to be encouraged. Also they were willing to get amongst it and get their fingers into the soil. A most rewarding experience.’ **Dr. Michael Braunack (host)**

Table 5: List of the students and their placement

Year	Student	State	Placement	Host	Location
2013	Billy Browning	NSW	Australian Cotton Research Institute	Various Researchers	Narrabri
2014	Kirsty McCormack	NSW	CRDC Communications	Ruth Redfern	Narrabri
2015	Kirsty McCormack	NSW	Cotton Australia	Sophie Davidson	Narrabri
2014	Paul Sanderson	NSW	Cotton Grower	Stuart Armitages	Queensland
2014	Jessica Kirkpatrick	NSW	Cotton Grower	Warwick Wannan	Moree
2014	Emily Miller	WA	Cotton Grower	John Hampersums	Breeza
2014	Charlie French	NSW	Auscott Ltd/ Aquatec	Martin Meade	Narrabri
2015	Charlie French	NSW	Cotton Info Water Tech Specialists	Janelle Montgomery	Emerald/ Moree
2015	Alana Martin	WA	Soils at ACRI	CSIRO and NSW DPI	Narrabri
2014	Felicity Taylor	NSW	Cotton Australia	Sophie Davidson	Sydney
2014	Sam Johnston	NSW	Cotton Grower	John Hampersums	Breeza
2014	Michael Wellington	QLD	Cotton Grower	Nigel Corish	Goondiwindi
2014	Grace Scott	NSW	Plant Breeding (CSIRO)	Danny Llwelwlyn	Canberra
2015	Annie Warren*	NSW	Soils at ACRI	CSIRO and NSW DPI	Narrabri

*Non CRDC funded student

f. Support the post graduate program.

- i) Coordinate and deliver educational interactions for post grad program

The PhD student tour “Cotton Careers – from Farm to Fashion” was held on the 13th & 14th of May 2014 and was organised by Helen Dugdale from Hell on Wheels Consultancy, Mrs Kara Taylor and Di Purcell from CRDC and myself. Fifteen students attended from 8 institutions along with 3 past PhD students just starting their careers within the cotton industry. The tour was designed to showcase other parts of the cotton industry that the students were unaware of from their studies. It incorporated cotton growers from family owned enterprises to large corporate farms, cotton ginning and quality testing, cotton agribusinesses, and research at the Australian Cotton Research Institute. Students got to see firsthand the process cotton takes on its journey from the farm to becoming a fabric. Students had a number of opportunities to network with cotton industry representatives such as researchers, extension officers, corporate CEO’s and growers.

g. Work Force Development Support Gordon Stone Project

- i) Liaise with cotton Industry Agribusinesses to set up a student organisation network

The cotton industry is seeking out high quality, skilled and passionate young people who can be brought into the industry in a coordinated manner. By way of achieving this the CRDC commissioned Mr Gordon Stone (Project GSA1501) to define the cotton agribusiness sector’s needs for highly quality, skilled professional personnel. Attraction and retention of skilled and engaged personnel is the main purpose of this project as well as to assure the agribusiness sector that there is an availability of worthy personnel and how best we can facilitate their interaction with the cotton industry.

My role was to liaise with Mr Stone and the targeted agribusiness surveyed in the project to develop a network of suitable students for placements. This involved attending collaborator meetings to assess employer needs and constraints and develop a model and the use of a database of possible employees. It was apparent, from those attending the agribusiness collaborator meeting that this project is currently filling an important gap in the market – in other words, there is a form of market failure. Discussions centred on the timing of the placements, the length and duration of placements and how to recruit students. The conclusion from employers attending the meeting was that some form of customised recruitment process, based around ‘try before you buy’ and focussed very strongly on close employer-student-University relationships specific to the cotton industry, would continue to be valuable to the industry in the future as their suitability can be judged via their placement.

Using my existing network of students from the PICSE internship program I was able to facilitate the placement for 5 days of 10 undergraduates from 3 of the targeted universities into positions with the collaborating agribusiness. See table 6 for the placements and Appendices 1 and 2 for undergraduate reports. The feedback indicated that this program is worthwhile and continues to link industry with students.

“It was a great experience and I made some strong contacts within the industry.....I now have a far better understanding on how the cotton industry works and operates and the vast amounts of opportunity there is within the industry”. Stirling Robertson (student)

Joanna Nielsen spent her five day placement with Dr Karen Kirkby from NSW DPI in the area of biosecurity and pathology. As a result of her placement Johanna has chosen to include three microbiology courses in her biology major on her return to University.

*‘Very proud to showcase the exciting opportunities in science. Having students engage with myself and the pathology team has been very rewarding especially when receiving positive feedback from students’. **Dr Karen Kirkby (host)***

Table 6: List of the students and their placement

Name	State	Placement	With	Location
Johanna Nielsen	QLD	NSW DPI Biosecurity Pathology	Dr Karen Kirkby	Narrabri
Johanna Nielsen	QLD	Landmark Pittsworth	Mr David Milne	Pittsworth
Penny Wright	NSW	NSW DPI Soil Science	Mr Graeme	Tamworth
Maggie Falla	NSW	Aquatec	Mr Jim Purcell	Narrabri
Joe Druce	NSW	Auscott ltd	Mr Martin Mead	Narrabri
Rebekah Watson	NSW	NSW DPI Biosecurity Pathology	Dr Karen Kirkby	Narrabri
Bernard Walker	TAS	QDPI Biosecurity Pathology	Dr Linda Smith	Toowoomba
Sharna Holman	NSW	Cotton Seed Distributors	Miss Rebecca Cope	Wee Waa
Stirling Robertson	QLD	Ag engineering	Namoi Cotton, Auscott, Aquatec	Wee Waa, Narrabri
Ned Skehan	QLD	Ag engineering	Namoi Cotton, Auscott, Aquatec	Wee Waa, Narrabri
Kate Lumber	NSW	ACRI	Various researchers	Narrabri
Gabriel Thelen	NSW	CSU Pathology	Mr Joe Moore	Wagga Wagga

Outcomes

This project made an important contribution to the industry and rural communities as it worked towards defining career pathways for potential cotton industry employees. The industry and community benefits may not be immediately apparent but will develop in the years to come. The outcome of this project is that it will make a significant contribution to the continued supply of educated, highly qualified, skilled and passionate workers to the industry and a more science and agriculturally aware community.

We have selected two approaches to detail more specific outcomes. The first is summarised in Table 7 which gives examples of the career pathways of 5 students that have interacted directly with several initiatives in the ongoing schools project. For example Kate Lumber was involved with the PICSE camp and internship programs, received a Cotton Australia Cotton Conference scholarship and a final year project scholarship and has secured work with an agronomy company establishing in the southern cotton growing region. Another example is Ethan Towns who is a high school student from Wee Waa who participated in the PICSE SEIA's and is currently undertaking a school based indigenous traineeship with the CSIRO Agriculture resistance evolution team at ACRI.

Table 7: Student Pathways

		Engagement						
Student	Current Institute	First	Second	Third	Fourth	Fifth	Sixth	Seventh
Kate Lumber	UNE	PICSE SEIA's	PICSE Industry Placement	PICSE Ambassador	CA Conference Scholar	PICSE Undergrad Internship	CA Final Project	Trainee Agronomist
Kirsty McCormack	UNE	PICSE SEIA's	PICSE Industry Placement	PICSE Ambassador	CRDC Horizon Scholar	Young Farming Champion	CRDC Conference Scholar	
Johanna Nielsen	USQ	PICSE SEIA's	PICSE Industry Placement	PICSE Undergrad Internship	CA Conference Scholar	CRDC Summer Scholar	PICSE Undergrad Internship	
Sharna Holman	USYD	CA Conference Scholar	CRDC Summer Scholar	PICSE Undergrad Internship				
Grace Scott	UWS	PICSE Industry Placement	CRDC Horizon Scholar	CRDC Conference Scholar				
Ethan Towns	Wee Waa High School	PICSE SEIA's	Work Experience	CSIRO AES Trainee				
Stirling Robertson	USQ	PICSE Undergrad Internship	CA Conference Scholar	CA Final Project				
AES PICSE SEIA CRDC CA		Aboriginal Employment Strategy Primary Industry Centre for Science Education Science Engineering Investigation Awards Cotton Research & Development Corporation Cotton Australia						
		 Transition to University						

*‘This program which I was exposed to through PICSE has really enabled me to make a splash and exposed me to many aspect of the Agriculture industry’ **Kirsty McCormack***

A second approach is to try and track the impact of our programs at local high schools in the region directly through subject choices taken by year 10 students for their year 11 curriculum. Table 8 shows data from 3 high schools from 2009 to 2015 in terms of the number of students in year 10 choosing year 11 science subjects. It also indicated the first year that the education program interacted with students (highlighted in grey for each school – see legend). In order to go on and do a degree at University students must engage in biology, chemistry and/or physics, rather than senior (general) science.

At Narrabri High School 2010 was the first year that a science interaction was conducted through PICSE SEIA's which targeted year 10 science students; in 2011 there was a marked increase in the proportion of students selecting biology relative to 2009 and 2010 which is reflected in the higher proportion of students doing science as a whole. These proportions fluctuate over the following several years but as a whole the proportion of students engaged in science since the first interaction is 10-25% greater than before it.

At Wee Waa High School 2011 was the first year that a science interaction was conducted through PICSE SEIA's which targeted year 10 science students; in 2012 there was marked increase in the proportion of students selecting biology relative to 2011 which is reflected in the higher proportion of students doing science as a whole. These proportions fluctuate over the follow several years and do not show any consistent trend for there to be greater engagement over time. This could reflect changes during these years in the availability of teachers to deliver science subjects.

Biology, chemistry and physics were offered in 2010 for the first time at Bingara Central High School through distance education. With respect to this project, 2012 was the first year that a science interaction was conducted through a workshop which targeted year 10 science students; in 2013 there was a substantial increase in the proportion of students selecting biology and chemistry and senior science relative to previous years which is reflected in the higher proportion of students doing science as a whole. These proportions fluctuate over the follow several years but as a whole the proportion of students engaged in science since the first interaction is 15-55% greater than before it.

Table 8: School Science Subject Choices

School	Year	Total Students	Biology	Chemistry	Physics	Total	Senior Science	Total % Doing Science
Narrabri High School	2009	110	11% (12)	14% (15)	10% (11)	35% (38)	8% (9)	43% (47)
	2010	106	10% (11)	12% (13)	6% (6)	28% (30)	17 % (18)	45% (48)
	2011	97	23% (22)	16% (15)	14% (14)	53% (51)	16% (15)	69% (66)
	2012	118	18% (21)	18% (21)	8% (9)	43% (51)	10% (12)	53% (63)
	2013	102	14% (14)	18% (18)	7% (7)	38% (39)	25% (25)	63% (64)
Wee Waa High School	2010	34	24% (8)	12% (4)	0% (0)	36% (12)	3% (1)	39% (13)
	2011	21	10% (2)	14% (3)	0% (0)	24% (5)	14% (3)	38% (8)
	2012	34	27% (9)	3% (1)	0% (0)	30% (10)	35% (12)	65% (22)
	2013	26	19% (5)	0% (0)	0% (0)	19% (5)	19% (5)	38% (10)
	2014	33	18% (6)	6% (2)	0% (0)	24% (8)	12% (4)	36% (12)
Bingara Central High School	2015	31	10% (3)	0% (0)	0% (0)	10% (3)	19% (6)	29% (9)
	2009	8	0% (0)	0% (0)	0% (0)	0% (0)	25% (2)	25% (2)
	2010	17	6% (1)	6% (1)	0% (0)	12% (2)	18% (3)	30% (5)
	2011	12	0% (0)	0% (0)	0% (0)	0% (0)	100% (12)	100% (12)
	2012	16	0% (0)	0% (0)	0% (0)	0% (0)	31% (5)	31% (5)
	2013	9	44% (4)	22% (2)	0% (0)	66% (6)	22% (2)	88% (8)
	2014	12	25% (3)	25% (3)	0% (0)	50% (6)	17% (2)	67% (8)
	2015	11	18% (2)	18% (2)	0% (0)	36% (4)	9 % (1)	45 % (5)
First interaction with science education program through this project Science subjects first offered by distance education								

Please describe any:-

a) technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.);

There were no technical advances achieved.

b) other information developed from research (eg discoveries in methodology, equipment design, etc.); and

There were no discoveries in methodology.

c) Required changes to the Intellectual Property register.

No changes required.

Conclusion

The three key activities listed below are integral in the impact that the project had on benefiting the industry by securing access to better educated, professional and loyal employees for the future, and by creating local communities who better understand one of the key industries that underpin their economies. The Enviro Stories competition is the main event that introduces primary aged students to science, agriculture and the environment in a fun interactive way, whilst the PICSE program influence high school students by offering and insight into career opportunities in science and agriculture. The young cotton professional program will establish a network for university students to gain valuable skills and knowledge and links with industry that will benefit the industry as a whole with the availability of high quality, engaged, and skilled professionals.

Key activities.

Enviro stories: We believe that this is an efficient way to impact primary schools (public & private) across cotton regions and areas close to cotton growing areas. The competition is curriculum based with education kits and information packs available online. Many schools continue to contribute and factor it into their yearly school plan. This activity is a stepping stone in introducing science and agricultural related concepts and is moving into the digital era with books available online.

PICSE: The Primary Industry Centre for Science Education promotes Science & Agriculture to high schools (public & private). The program consists of class visits, science investigations, industry camp, industry placement, undergrad internships, teacher personal development, and CD resource development. This activity engages students and teachers to participate in science and agriculture areas with a 'hands on' approach and gives them a solid back ground in what careers are available within the cotton industry. It is an integral part of the young cotton professional program having an already established and proven model.

Young Cotton Professionals: This component was designed to establish better links with Cotton Agribusinesses and match them with suitable undergrad students for work placement experiences. Importantly, this project provided a proactive methodology for the cotton industry to seek out high quality, skilled and passionate young people. Their suitability was judged via placements with cotton agribusiness employers and through a structured process a database of suitable employees can be developed, based on feedback from host employers.

Extension Opportunities

Detail a plan for the activities or other steps that may be taken:

(a) to further develop or to exploit the project technology.

N/A.

(b) for the future presentation and dissemination of the project outcomes.

I will present outcomes and findings from this project at the Australian Association of Cotton Scientist conference in Toowoomba 2015. I also intend to summarise these in an article for the Australian Cotton Grower Magazine.

(c) for future research.

A new project which started in July 2015 will build on the previous projects and aims to capitalise on the initiatives to date: to be the central point of contact for education related matters in the cotton industry; initiate and develop programs that support newcomers to the industry e.g. PhD students, summer scholars, etc; facilitate interactions between schools, industry and rural communities that develop future workforce capacity for the industry; and support the integration of industry and agricultural science into education resources. Another aim is to attract, develop and retain skilled people in the cotton industry. The project will maintain established links with education organisations, government agencies and industry bodies to promote science and agriculture in cotton regions. It will link with other industry investments in education, development and delivery.

**9. A. List the publications arising from the research project and/or a publication plan.
(NB: Where possible, please provide a copy of any publication/s)**

Through local media outlets, articles include

- CRDC spotlight magazine winter edition 2014
 - o PhD students tour their future industry
 - o Brining Uni Students to Cotton
 - o Love what you do
 - o Scientist share passion for research
- Narrabri Courier 13th September 2012 Young Scientists
- Narrabri Courier 1st November 2012 School News Narrabri West Public School Enviro Stories Winner
- The Land June 13th 2013 Staff Article 'Ways to keep workers' swapping staff
- Narrabri Courier 20th June 2013 Narrabri Public School Town Talk News Enviro Stories Science Day
- Narrabri Courier 29th August 2013 Narrabri Public School Town Talk News PICSE SEIA
- Narrabri Courier 20th March 2014 'Exploring Cotton Career Opportunities' 20/03/2014
- "Careers By Kids for Kids" Cotton Conference e-poster August 2014
- 'Cotton Industry Internship Pays off for USQ Students' Media Release 01/04/2014
- 'Writing Program Focuses on Farming Families' Media Release 28/04/2014
- Narrabri Courier 15th April 2015 Narrabri Public takes class room outside.
- Narrabri Courier 15th April 2015 School Science day introduces students to the range of science topics in the district.
- Wee Waa High School Newsletter issue 8 June 15th 2015

B. Have you developed any online resources and what is the website address?

N/A.

Part 4 – Final Report Executive Summary

In 2008 the Cotton CRC invested in an Education Officer, Trudy Staines, for 5 years to promote science and agriculture in schools. The schools program was developed to enhance and expand the science and environmental management syllabus in primary and high schools by providing relevant cotton information and opportunities for practical on-farm activities. The strategy proposed by the Cotton CRC was the promotion of science and agriculture in schools to encourage school students into careers in science and agriculture, specifically the cotton industry through collaborations with school teachers, scientists, the cotton extension teams, industry, catchment and government education agencies, to encourage primary and secondary school students to develop resources and implement science and agricultural based activities that engage students and ultimately promote the cotton industry as an employee's career of choice. The three year project reported on herein is the continuation of that initial project directly with the CRDC.

All of the main objectives of this project were met: to (1) become the central point of contact for industry education; (2) support the continued development of existing industry education initiatives; (3) actively engaging with PISCE; (4) represent the cotton industry in numerous education initiatives; (5) support undergraduate programmes; (6) support the industry post-graduate program; and (7) work with Gordon Stone in developing a new strategy for work force development.

Notable achievements included: (1) delivering the “Enviro stories” competition which is curriculum based with education kits and information packs available online. This activity is a stepping stone in introducing science and agricultural related concepts and is moving into the digital era with books available online; (2) engaging with The Primary Industry Centre for Science Education to promote Science & Agriculture to high schools (public & private). The program consists of class visits, science investigations, industry camp, industry placement, undergrad internships, teacher personal development, and CD resource development. This activity engages students and teachers to participate in science and agriculture areas with a ‘hands on’ approach and gives them a solid back ground in what careers are available within the cotton industry. It is an integral part of the young cotton professional program having an already established and proven model; and (3) Establishing better links with Cotton Agribusinesses and matching them with suitable undergraduate students for work placement experiences. Importantly, this project provided a proactive methodology for the cotton industry to seek out high quality, skilled and passionate young people. Their suitability was judged via placements with cotton agribusiness employers and through a structured process a database of suitable employees can be developed, based on feedback from host employers.

This project made an important contribution to the industry and rural communities as it worked towards defining career pathways for potential cotton industry employees. The industry and community benefits may not be immediately apparent but will develop in the years to come. The outcome of this project is that it will make a significant contribution to the continued supply of educated, highly qualified, skilled and passionate workers to the industry and a more science and agriculturally aware community. We detailed examples of the career pathways of 5 students that have interacted directly with several initiatives in the ongoing schools project. We also tracked the impact of our programs at local high schools in the region directly through subject choices taken by year 10 students for their year 11 curriculum.