Australian Government
Cotton Research and Development Corporation

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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Date Submitted: _____

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 Distributers 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

			No. Entries by School Type		No. Schools Involved	
Year	**Awards**	**Total No. Participants**	**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
Conferences /Forums				
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
Major Display/ Events				
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
Tours/ Visits				
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
Tocal Students	2014	1	Conducted	ACRI
Narrabri Probus	2015	1	Conducted	ACRI
Workshops/ School Visits				
Schools	2012-2014	17	Presented	Various
Work Experience				
High School Students	2012-2015	10	Facilitated	Various
Meetings *(major)*	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 NSWDPI	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 NSWDPI	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 Roberton (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 Distributers	Miss Rebecca Cope	Wee Waa
Stirling Roberton	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 Roberton	USQ	PICSE Undergrad Internship	CA Conference Scholar	CA Final Project				

AES Aboriginal Employment Strategy
PICSE Primary Industry Centre for Science Education
SEIA Science Engineering Investigation Awards
CRDC Cotton Research & Development Corporation
CA 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)**
	2015	31	10% (3)	0% (0)	0% (0)	**10% (3)**	19% (6)	**29% (9)**
Bingara Central High School	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
  - PhD students tour their future industry
  - Brining Uni Students to Cotton
  - Love what you do
  - 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.

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.

Australian Government
Cotton Research and Development Corporation

Industry Placement Scholarship Program

Cotton Activity Centre

2013/2014

National Funding Bodies

Australian Government
Cotton Research and Development Corporation

Australian Government
Department of Education

GRDC
Grains Research & Development Corporation
Your GRDC working with you

FRDC
FISHERIES RESEARCH & DEVELOPMENT CORPORATION

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Australian Government
MURRAY–DARLING BASIN AUTHORITY

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Partner Universities

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EcoSciences Precinct, Boggo Road

Elders Killara, Quirindi

Health & Food Sciences Precinct

Hermitage Research Station, Warwick

Leslie Research Centre, Toowoomba

Monsanto

Murray Darling Basin Authority

Namoi Cotton

Pacific Seeds

Purhouse Rural

Queensland College Wine Tourism

Roth Rural & Regional

SCU National Centre for Marine Science

Sheep Genetics - UNE

USQ – Centre for Systems Biology

USQ - Faculty Health, Engineering and Sciences

USQ - National Centre Engineering in Agriculture

UWS Hawkesbury Institute for the Environment

Vanderfield

Tiarni Bellerby

School: **Pittsworth State High School**

Industry Placement: **Murray Darling Basin Authority, Canberra**

> ***"Being involved in the PICSE Industry Placement Scholarship Program, in partnership with The Murray-Darling Basin Authority, has been a great learning curve for myself and has been an even greater stepping stone to a future career in Environmental Science."***

Industry Placement Camp

The PICSE Industry Placement camp is a perfect opportunity for aspiring scientists to establish their passion for a future career in the primary industry. Personally, being interested in environmental science, this camp stood out to me as I believed it would be a strong foundation for my future endeavours into studying the environment, and six weeks after the camp I still believe it has helped me more than anything.

On the first day of camp we all arrived with our suitcases and pillows expecting a pretty breezy week, all focusing on the fun night activities we had heard about, but once seated in the dining hall and handed our itinerary for the week, I thought to myself that I may have bitten off more than I could chew – a room full of people that I didn't know, an unfamiliar setting and a piece of paper overflowing with locations and times for the next five days.

However, after the first day of camp hanging around the USQ campus doing some hands-on activities with PhD students in the laboratories and making liquid nitrogen ice-cream with professors, I made some new friends and was eager to start day number two.

Throughout the week we did a lot of hands-on activities and outdoor work relating to the primary industries. We visited the Hermitage Research Centre, a local cotton farm, the Food Sciences Precinct at Coopers Plains and some primary industry based companies like Vanderfield, Monsanto and Pacific Seeds. This was a great opportunity as tours and educational material isn't generally available to the public.

The camp was a great experience and perfect opportunity for all students involved to get out and see the practical side of things in the primary industry as we'd be able to see the diversity and more behind the scenes work in our placements.

My Industry Placement

As part of the program, all students that participated in the camp were given the opportunity to go on industry placement. I was privileged enough to go the Murray-Darling Basin Authority in Canberra. The Murray-Darling Basin Authority's primary focus is keeping all rivers, wetlands and floodplains connected to the Murray and Darling Rivers' sustainable and functioning.

Throughout the week in Canberra, another student and I were based with the education team and each half of every day we were able to spend with a different department within the authority. We started our very first day off by attending the Basin Plan meeting which was just a general catch up of where each department is sitting and what their current projects are. This was a great starting point for both us PICSE students as it laid down a lot of basic information about what the authority does. After the Basin Plan meeting we met up with some staff from the media team – and while still interesting on an average day, we got to see the rush of a media release regarding the Authority's opinion on a water trade issue. Following on from the media team, we were on our way to end the day at the River Health department with Katie Ryan. Katie gave us some valuable information on Murray-Darling River health, the Native Fish Strategy and demonstration reaches.

To kick off our second day at the MDBA, we spent the morning with Dave Hohnberg and Samantha Lucas at The Living Murray Monitoring department. For me, this was the highlight of my trip as it related to the work I hope to be doing when I complete my university studies in environmental sustainability. During our time with TLM we learnt about integrated catchment management, the Murray-Darling commission, the six icon sites and understanding ecosystems. This session was not only the most interesting and relatable for me but was also highly beneficial for my Year 12 assessment on water quality in the Condamine River.

Before moving on to our next session of the day we got to tag along to the education team's weekly catch up meeting with Janna Randell, Denise Fowler and their boss, Katrina Maguire. This was another great experience for us to witness some more of the theoretical, behind the scenes work as opposed to the hands-on, outdoors work we experienced on camp.

I must admit that after coming back from lunch and reading that we'd be spending half the afternoon with the social and economic team I yawned at the thought of it – however, after what felt like 15 minutes of listening to the team explain what their roles are, the two-hour session was up. I surprised myself by being interested in what most people aren't – until now I never knew how much behind the scenes work that no-one sees, goes into the practical work that a lot of people know about.

To wrap up the day on a more tranquil note, Kim Whale from the Northern Basin department took us in and educated us on the Northern Basin side of the Authority. This was a great session for the both of us as we both come from the northern part of the basin

whereas the main focus within the department is on the southern. Kim gave us a fun web-site based activity to finish the day where we were able to gain more general information on the basin and the Authority.

Wednesday was another very informative and interesting day commencing with River Ops' Sean Kelly. We were eager to spend some time with this team as throughout our prior sessions we'd heard many other staff claim how awesome and interesting River Ops is and how they'd love to be part of that team, so we were finally able to see what the fuss was all about – and I definitely understand and agree now!

As a regular treat for MDBA staff, guests from outside authorities/institutes/organisations are invited each week to share their latest research and projects. Dr Akeroyd shared some information about the Goyder Institute's latest research priorities and how the Institute currently has Professor Rayner visiting the Goyder Institute doing some of his own research on behalf of Oxford University relating to weather forecasting and climate change.

To end the day on a far too much fun note for a work day, we were able to spend the afternoon at Questacon – the National Science and Technology Centre - where we watched the 'trickle down' show that teaches the story of humans in the Murray-Darling Basin using the water and the steps needed to take to secure Australia's economic, social and environmental future. This was a great way to see how easy it is to educate the general public on the Murray-Darling Basin in a fun and simple way.

The Research and Knowledge department was our first stop on our second last day at the MDBA. Carrie and Nadine set up a great thought-provoking exercise for us to do which consisted of getting us to think about how water can be managed in particular situations that may occur in communities. After getting our brains into gear and on a roll, we headed back upstairs to meet with Willam Vlotman from Basin Plan Modelling where we were shown how the Geographical Information Systems work and how important they are in predicting rainfall in the basin etc. And to end the day we met up with the international and Indigenous engagement team.

Just as we were starting to get used to all the acronyms and terminology at the Authority, the final day of our trip had arrived and we got to spend the morning in a slightly daunting setting – behind the camera! With the help from all-round tech guy Brayden, we got placed in front of a green screen and asked a whole heap of questions. At the commencement of our industry placement I got asked if I was nervous at all; I said I wasn't nervous, just excited, however, Friday morning saw me nervous after being told we were getting filmed! Although this was a scary thought for me, it was a great experience for me and I'm so lucky to have been given the opportunity to do so.

To wrap up our incredible week at the Murray-Darling Basin Authority, we were able to get involved with the National Youth Science Forum students' session at the MDBA. This was a great opportunity to meet other

students interested in a career in science and network with additional MDBA staff from departments that we hadn't the opportunity to visit.

How My Placement Influenced Me

Before hearing about the PICSE program I had always been interested in the environment and how I could get involved in helping out – whether it was ocean conservation or land rehabilitation, I was always interested in what had to be said. However, before going to the Murray-Darling Basin Authority I barely knew anything about the basin and that I lived in it – which made me even more interested in what it implicated.

Being involved in the PICSE Industry Placement Scholarship Program in partnership with The Murray-Darling Basin Authority has been a great learning curve for myself and has been an even greater stepping stone to a future career in Environmental Science. I can't express how beneficial the information I received during my visit will be for my further study of the Condamine as I commence my senior year of high school. I will never forget all of the friendly, welcoming faces of the staff at MDBA as they made my week so great that I leave with the hope of returning some day!

Acknowledgements

My gratitude towards everyone involved in landing me where I am now is immense! So much work goes on behind the scenes for once in a lifetime opportunities like this to happen and I can't thank everyone enough for all of their work put into this program.

A major thank you to Kay Lembo and Ingrid Gow for being the main reason this whole program went ahead basically, from the interviewing process, staying on campus with us for a week and organising all of our placements. I can't imagine trying to organise a week like this for myself let alone 27 or so other students as well. These ladies are absolute wonder women and without them none of us would be where we are now – so thank you so much to Kay and Ingrid!

I'd also like to say another huge thank you to Denise Fowler and Janna Randell from the education team at the MDBA for not only accepting to have us spend a week with them but organising one the most informative and influential work experience week's that most students only wish they could have. Also a thank you to all MDBA Staff mentors for offering their time to educate us on their field within the MDBA and for being so incredibly welcoming, without these staff member the week would never have been as great.

Clint Caldicott

School: **Pittsworth State High School**

Industry Placement: **National Centre for Agricultural Engineering, USQ, Toowoomba**

> ***"I was influenced heavily by realizing how big a part science plays in everyday life. The camp made me think that everything in our world is related to science - even the flavour of cheese, the cotton in our shirts and irrigating a crop."***

Industry Placement Camp

The PICSE Industry Placement Camp was first introduced to me by teachers at my school. Willing to participate in the program and keen to acquire scientific knowledge and experience, I applied and was accepted into the scholarship. When I arrived at the camp, I was greeted by Ingrid, Kay and some of the other students. From that moment on I knew that an interesting and valuable week of science lay ahead.

The camp offered many experiences delving into the world of Science, both on campus at USQ Toowoomba and at other facilities. This enabled me especially to experience not only the laboratory workplace but also the areas of field work. A major standout of the camp was the visit to the Queensland Centre for Forensic and Scientific Research, in Brisbane. Visiting the Government facility made me realize how much we need science in society, no matter if it's as big as finding a cure for a disease or experimenting to make a tastier food. During the tour of the Centre, we were shown and informed on the role and importance of food technologists. Their main role is to develop and improve food products while maintaining food standards. Improving a food may consist of experimenting with ingredients which could extend the storage life of a product.

Our visit to Pacific Seeds in Toowoomba was another highlight of the camp. The focus on plant breeding was very interesting – with their main aim to improve sorghum plants to provide a better crop for the famer. By making a better grain, growers, resellers and seed companies benefit from a higher income. Objectives of making a better grain can be to increase the yield rate, increase oil content of seeds, make plants herbicide tolerant or make the mature stage of the plant occur earlier. Through plant breeding, companies can make

more money and produce a better crop; however, we did learn that plant breeding takes a very long time – approximately eight years to get a new breed of plant on the market. The camp was very informative and interesting but it was always nice to sit down at the end of the day and chat to others with a similar interest to you.

My Industry Placement

During the PICSE scholarship I attended a week of work experience based at the National Centre for Engineering in Agriculture, at USQ Toowoomba. For the week I was based with two researchers, Alice Melland and Dr Pam Pittaway, focusing on soil and environmental science. During the week I assisted with their experiment which had the aim to determine the effectiveness of granular and liquid fertilizer on sugar cane. The liquid formulation was hypothesized that it may have a higher possible amount of leaching, leaving the cane plant with an inadequate supply of fertilizer. While working on the experiment I recorded and measured data, prepared fertilizer applications, prepared soil samples for planting cane, watered plants in the field experiment, assisted with the preparation and measuring of leaching columns and removed cane plants and roots from existing test columns. Throughout the week I also spent time with Agricultural and Biosystems Engineer, Nathan Woodhouse. During my time with Nathan, we used a piece of equipment called a penetrometre – which uses the force needed to be pressed into the ground, giving a measurement of soil compaction. Being able to measure soil compaction is important to build roads to know if an area is strong enough to support traffic but it is also important in Agriculture. If there is too much soil compaction on farming land, the cause needs to be restricted or eliminated as plants cannot develop. Dr Troy Jensen from the NCEA explained that frequent use of heavy vehicles such as tractors and spray rigs can cause soil compaction and effects can be eased through controlled traffic farming.

My placement at USQ also saw me speaking to hydro-geologist, Dr Elad Dafny. This was a significant highlight of my placement as geology is the area that I want to study at university. It was great to hear how he worked his way up to his current position and what he actually does as a hydro-geologist. During my time with him we discussed the geological formation of the Toowoomba area - why there is red soil and black soil in the area and also the health and environmental implications that coal seam gas removal has. My placement at USQ was very enjoyable, but, more importantly informative and gave me quality experience into an area that I am interested in.

How My Placement Influenced Me

Even though the placement and camp didn't make me change my proposed study area of geology to agricultural science, I was influenced heavily by realizing how big of a part science plays in everyday life. The camp made me think that everything in our world is related to science – even the flavour of cheese, the cotton in our shirts and irrigating a crop. Sciences such as food technology and plant breeding may not be as popular or as 'cool' as astrophysics, but they play a major role providing suitable materials and safety standards in farming. Without sciences dealing with the agricultural area, diseases and food technology, the end to the agricultural industry not only in Australia but in the world could be possible. So, I found it very important that we encourage science to our friends, younger children and even teachers, to make them aware that science – no matter how big or small - plays a major role in the functioning of us on Earth as a society and a planet.

Acknowledgements

During my placement and camp I met many people who were happy to share their experiences related to science. We attended many sessions where we were infused with useful information to do with career choices and the real world. I would like to thank all those who assisted and presented at the camp, including everyone at USQ and at other facilities. A major thank you must go out to both Kay Lembo and Ingrid Gow for organizing the camp, my placement and my position in the scholarship. A special mention must also go to Dr Troy Jensen who organized and overlooked my work placement. Without these people I wouldn't have been able to attend the camp and my industry placement. A big thank you must go to those who I spent time with during my placement, such as Nathan Woodhouse, Dr Elad Dafny, Alice Melland and Dr Pam Pittaway. They were exceptionally great people to work with and provided me with a very interesting and enjoyable schedule every day. It was great to work with such professional people and my uppermost gratitude goes out to you all.

Grace Jackson

School: Narrabri High School

Industry Placement: Killara Feedlot, Quirindi

> ***"During my week at Killara Feedlot I learnt a lot, from the feeding of the cattle, drafting cattle, necropsy (autopsy of an animal), inducting new steers and heifers daily and the lovely job of trough cleaning."***

Industry Placement Camp

The camp that I attended in Toowoomba was very eye opening. It showed me that there was a lot more to Agriculture than just working on a property. The camp at the beginning was nerve wracking, although a few people that attended the camp alongside me came from my school, I still didn't know what to expect the other campers to be like.

The camp had its ups and downs but was all round a good learning curve. The only bad part to the camp was that we were never stopping, the only real break we got was bus trips to various places and lunch and sleep time. At the end of the camp it was hard to keep concentration because I was so tired.

Overall the camp was good, I learnt a lot of stuff that I will be able to use further on in life after I commence pursuing my career.

My Industry Placement

Killara Feedlot, a rural-based business located near Quirindi that is owned by Elders, is an Australian company. Killara has government approval for a feed mill, and lot feeding of 20,000 cattle.

During my week at Killara Feedlot I learnt a lot, from the feeding of the cattle, drafting cattle, necropsy (autopsy of an animal), inducting new steers and heifers daily and the lovely job of trough cleaning.

Whilst working at Killara I experienced every aspect of the feedlot. Day to day it went from the unloading and weighing of the new stock. This would then be followed by the induction of them which involves drenching, ear tagging and banging of the tail.

Occasionally there was the odd trough cleaned. With every trough in the feedlot having to be cleaned twice a week to ensure that the stock are drinking clean water.

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With stock often becoming sick from heat stress and dying, someone from the feedlot has to complete a necropsy to confirm the death of the beast and write a report so that the feedlot has it on record.

How My Placement Influenced Me

My week of work placement opened my eyes to the cattle industry. It proved that there is more to working in a feedlot then just riding around checking cattle all day. In actual fact it is one of the most technical and risky jobs out there; simply because steers are big and heavy and they can just snap at any second. I loved my work placement and I could see myself working in an industry like that. I just wished that it was longer than a week because I loved it that much.

Acknowledgements

I would like to thank the, Cotton Research and Development Corporation for funding the program, University of Southern Queensland for hosting the PICSE program for 2013, I would like to thank all the places that we attended for giving up their time to talk to us and I would like to thank Mr Steve Martin and Mr Tony Fitzgerald for allowing me to complete my work placement there and for taking the time to show me what it is that they do.

Sally Maher

School: Narrabri High School

Industry Placement: National Marine Science Centre, Southern Cross University, Lismore

> ***"My week of work experience at the Southern Cross University National Marine Science Centre was an amazing and valuable experience; I did not want it to end!"***

Industry Placement Camp

The week of the PICSE camp involved visiting many industry businesses and getting to know what they do. As a group we all learnt a lot from these experiences, what one of us didn't pick up on, the other did. The first day was exciting, yet we were all nervous. We were keen to see what we would be doing for the week and who we would meet, hoping to make new friends. It was less nerve-racking for me as there was a group of us from Narrabri, so we stuck together.

The first activity to start off our interesting week was DNA extraction from wheat. The DNA extraction really interested me, as I have never done anything like it before, especially on this scale. We were shown various types of 'professional' equipment, nothing like you would see being used at school. There were several processes involved to get the final product - DNA. Although I do not remember them clearly I was amazed at the result.

Two definite layers were visible. One containing the solutions we had added during the processes that helped break it down, the other layer containing the thread-like strands of DNA. This small experience changed my views of chemistry, how just a 5cm piece of wheat that had been shaken and crushed by a centrifuge and heated by an incubator (just some of the steps), could produce a mass of DNA.

After testing our brains in the lab we moved outside for one of my favourite activities of the week, making liquid nitrogen ice-cream! We got to make it ourselves, stirring the ice-cream mixture and the -196°C liquid nitrogen to make yummy vanilla ice-cream. After eating the ice-cream we were all happy and sat down for some liquid nitrogen demonstrations. These included putting a bunch of flowers in the liquid nitrogen taking them out and smashing them against a wall,

and putting a blown up balloon in the nitrogen, watching it shrink then taking it out, then it went back to normal when it got oxygen back. Also liquid nitrogen doesn't burn on contact with skin; it evaporates as long as you keep moving.

We visited so many interesting places that week, just to name a few: Monsanto, Pacific Seeds, Brisbane laboratories, and Brookstead Cotton property, on which we viewed soil rock profile, syphoned water into paddocks for irrigation and looked for insects in the cotton and sorghum fields. Our final day was at Hermitage Research Station where we split into groups and did an experimental activity and made a presentation. It was a great way to end our eye-opening week. We said our goodbyes to everyone, and then the few of us from Warialda, Narrabri and Gunnedah started our 8+ hour trip home. It's safe to say we were pleased to fall asleep in our own beds after a very big week.

My Industry Placement

My week of work experience at the Southern Cross University National Marine Science Centre was an amazing and valuable experience; I did not want it to end! I was working under Dr Ken Cowden who is the Aquaculture Operations Manager. I was really fortunate because at the same time there was a university student Lisa, doing work experience. We became good friends and spent our lunch breaks on the beach.

During this week I did some very interesting things with Ken. We collected data from 10 broodstock mangrove jacks. The data we collected included: weight (g), fork length (mm) and the sex male, female or unknown. Once the fish were identified as either male or female, a visible dart coloured either blue or yellow was put in the fish for easy identification in the future. The fish were also given a PIT tag (like a microchip). Also tiny samples were taken from the fin for genetic experiments.

Before any of this could be done though the Mangrove Jacks needed to be anaesthetised otherwise you could lose a finger, they have quite large, sharp teeth and a strong jaw. To sedate them a natural anaesthetic was used - 'clove oil' (which smelt really good) and it was put in the tank in required amounts. This was just the first day; I could tell it was going to be a pretty good week. We fed the mangrove jacks squid, whiting and pilchards. One of the fish 'Stormy' needed to be quarantined. First up he was put into formaldehyde for one hour. It is a highly dangerous chemical with very severe health risks, because of this PPE must be worn and the Material Safety Data Sheet (MSDS) read in entirety. After the hour was up, the fish was then transferred into fresh water. The treatments kill off any worms or parasites the fish may be carrying.

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The next few days involved transferring 17 mullet from a 30,000L tank to a nearby pond. To do this was a lengthy process. First the tank had to be drained which took almost a full day. Ken and I checked the water quality of the pond finding out the temperature, oxygen levels, pH, and salinity. The levels of salt in the water were very low. After establishing the low salt concentration, the sea water flowing into the mullet tank had to be adjusted and virtually put fresh water in. Mullet can tolerate change as they could also live in a fresh water environment. When the water was ready we used the clove oil to anaesthetise them and catch them, which proved difficult as they are a jumpy fish. They were then transported to the pond where they will hopefully help clean the pond.

Besides these big tasks we were doing, there were many little jobs to be done too, e.g.: backwashing the seawater pumps, collecting some mud samples, cleaning some tanks; which included the big 30,000L tank that Lisa and I climbed into using a ladder, and hoping Ken didn't take it away from us; testing my plumbing abilities; going to the co-op for food and bait; and my favourite, feeding the Brine Shrimp, otherwise known as 'Sea Monkeys,' which love very salty environments.

On Thursday Lisa and I got a fantastic opportunity to go to Lismore with a vet from the Pet Porpoise pool, to watch and participate in a post mortem of a dolphin! The dolphin had a virus that weakened it, which led it to be attacked by some sharks. It was washed up on the beach and euthanised. Data from the dolphin was collected: weight and external measurements and to determine if the dolphin was a male. Lisa and I had a go at extracting teeth from the dolphin until we were assigned the task of removing his reproductive organs, where we discovered he was only a young male. Blubber samples were taken for testing, and then we started on the dolphin, taking samples first on the abdominal side at the sterile organs then making our way to the head and the stomach. It was an interesting and amazing process, once in a life time experience that I will remember forever. Who else could say they did this in their holidays?

On my very last day it was sad knowing it would be my last time there. It was a relaxed sort of day while the 30,000L tank filled. Then the time came to anaesthetise the Mangrove Jacks again after recovering from Monday and putting them in their new home for the next year and a half, till it comes time for when they are mature enough to breed. It was a big week with every day something new to experience. Lisa and I had both fallen into a type of routine and gotten to know our way around. We spent the last half hour of our day looking at the wonderful marine life in the aquarium, before we said our goodbyes to everyone.

How My Placement Influenced Me

I learnt valuable knowledge from the placement, especially about the many career pathways in marine science. This experience has helped me to make a decision on where I would like to be in the future and the array of opportunities that comes with it. I hopefully would like a career that involves working with animals, especially marine animals as there is so much more to discover. The work experience has definitely led me onto the right track.

Acknowledgements

I would like to say a very big thank you to Kay Lembo and Ingrid Gow for making this week possible and organising everything for us! Without you I would not have been organised. Thank you to the PICSE team, the University of Southern Queensland and the people who gave their time in having the PICSE students during the camp week. Lastly but most important, thank you so much to Dr Ken Cowden for having me there for the week, I absolutely loved it.

Tori McLachlan

School: **Narrabri High School**

Industry Placement: **Sheep Genetics , Armidale**

> ***"My Industry Placement has influenced me by showing me a part of the Agricultural Industry that I didn't know existed. I didn't know much about sheep, especially wool sheep."***

The Industry Placement Camp

My week at The Industry Placement Camp started off in a mini bus from Narrabri to Toowoomba, with seven other Narrabri girls, a boy from Walcha and another girl from Gunnedah on a 5-6 hour trip.

My favourite activity from the first day was a tie between cereal research and making liquid Nitrogen ice cream, I enjoyed these activities because they were both very hands-on and I liked learning about cereal crops and the research that is involved when helping with disease resistance and finding new ways of assessing diseases in the labs at the University of Southern Queensland. Also while in the labs we were able to perform a DNA extraction of a seedling. Whilst making the liquid Nitrogen ice cream was really fun because we got to make our own cup of ice cream then eat it, it was also very interesting learning about liquid Nitrogen and that if it is poured on a moving hand it will not stick to the skin.

Day two I went to Brisbane Food Science Precinct, it wasn't quite as enjoyable as the day before because we got so much information that it was hard to retain everything they told us.

Day three was my favourite day because we went out to a farm and explained how that particular farm runs and what it grows. I thoroughly enjoyed learning how to siphon irrigation pipes, the only down side was that after I had a race with Annabelle (another girl participating in the camp) to see who could siphon more; I noticed that I ripped a little skin off my thumb. I'm proud to say I still won the race though.

Going to Monsanto was my favourite activity of day four. There were a few different things we did at Monsanto which included checking the sex of caterpillars to pair them, filling some moulds with protein that the caterpillars eat and moving larvae to bigger moulds.

The best activity on my last day at the Industry Placement Camp was collecting the data. My group was collecting main stems of sorghum plants then cutting off the leaves and putting them through a machine that measures the surface area of the leaves then weighing the stems and leaves together.

My Industry Placement

My industry placement was done at Sheep Genetics in Armidale on 7-11th January where I was working under Hamish Chandler. My first day was getting introduced to everyone working at Sheep Genetics, what their jobs are and what they needed to study to get into working at Sheep Genetics. I was also taken out to 'Kirby', one of the stations in Australia that Sheep Genetics use as a control flock when using the Australian Sheep Breeding Values (ASBVs). The ASBVs are first sent as raw data from farmers into Sheep Genetics so they can analyse it, process it, then put it into their huge data base. Then if there was a show, sale or field day, the ASBVs are already in the data base and can be easily be put on pen cards. Pen cards are pieces of paper that a farmer can hang next to their sheep and the ASBVs that are usually shown are; the yearling fleece diameter (YFD), the yearling clean fleece weight (YCFW), the yearling weight (YWT) and the worm egg count (WEC).

My second day was spent out with Hamish at his personal farm collecting faecal samples from a group of about 60 hogget aged rams. Taking the samples were simple enough, all that was needed was a sample jar, the ram, and … a long-handled teaspoon. I was lucky enough to only get one sample and drench a few rams, the rest of the day I was recording the number on the ram's ear tag to the numbered jar their samples went in. Hamish also showed me some tips about judging sheep at a show. The samples were then sent into a lab to get the number of eggs in each gram of sample counted. When we got back to the lab I completed pen cards for the online catalogue, and added in some sale dates on the Sheep Genetics website.

On my third day of my work placement I was shown how to put data for the eye muscle depth (EMD) and eye muscle width (EMW) into Excel. This data was from an experiment to see how accurate using an ultrasound is; the farmers using the ultrasound got the EMD and EMW of 40 sheep and recorded it, then the sheep were let out and put back through in a random order and their EMD and EMW were recorded again. Once the data was in Excel I got the standard deviation and the correlation for both EMD and EMW. The end result was that using an ultrasound to get the EMD was fairly accurate but getting the EMW via ultrasound was inaccurate because an ultrasound works by going straight down so getting the EMW is inaccurate and almost impossible to see. I also was introduced to Jo, a student in her final year of completing her PhD and helped her finish some pen cards for the New England Merino Field Days.

My fourth and fifth days were spent driving around to other farmers studs for the New England Merino Field Days. These two days were my favourite because it was really interesting to see what sort of ASBVs the

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farmers concentrate on most, if their sheep are poll, or if they're more traditional. Hamish also taught me how to judge wool and how to tell how fast the sheep's wool grows and if it dried properly through its life.

How My Placement Influenced Me

My Industry Placement has influenced me by showing me a part of the Agricultural Industry that I didn't know existed. I didn't know much about sheep, especially wool sheep, and I wasn't sure what to expect at Sheep Genetics. Sheep Genetics had a lot more computer work than I was expecting and I thought it would be more hands-on but it was still interesting to find out how the ASBVs are used to improve flock value.

Acknowledgements

It was an awesome experience and I'd like to thank everyone who organized it.

Brandi Megson

School: Gunnedah High School

Industry Placement: Cotton Growers Services, Gunnedah

"Having never lived on a property, one thing I will always be disadvantaged in is experience; however through my work placement I have begun to get the experience that I will possibly need for the future, while having a lot of fun in the process!!"

Industry Placement Camp

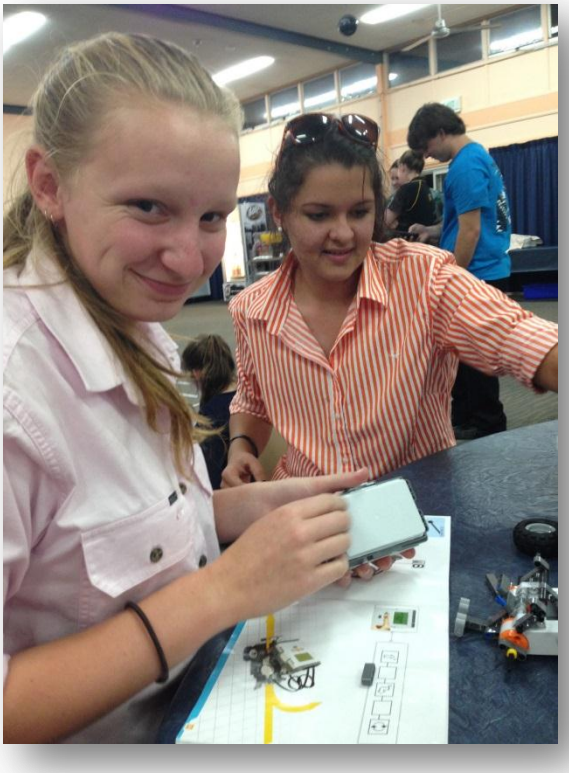
The PICSE Industry Placement was a big opportunity for me to expand my knowledge of the Agricultural Industry and the possible career paths that I could follow after University while expanding my contacts within the industry and making some pretty awesome new friends along the way.

The week at the University of Southern Queensland in Toowoomba was a real eye opener for me. I went into the week expecting something a little different to what happened however; it was a pleasant surprise that allowed me to see so many other aspects of the Agricultural industry that I previously didn't know existed in terms of the science involved, mix of new experiences, both in the field and in the lab and I wouldn't change a thing.

My favourite day was probably Wednesday because we spent most of the day out in the paddock - my favourite place to be! That and there was cotton involved, so I was definitely happy to be there and if you know me, anything involving cotton I'm crazy about! I also got to speak to a real life Property Manager and ask him about his job. This allowed me to get a bit of a sneak peak at a career I'm thinking about possibly pursuing. It was a great adventure that also allowed me to get a bit of an idea about what I would possibly be doing during the week of work experience which at that point was yet to come.

It was also interesting to get a look at the labs at the University of Queensland in Brisbane. Although I don't think I could handle the constant quiet of a lab, it was an interesting day that opened my eyes to the things that happen behind the scenes and not in the paddock. Without these people the agricultural industry wouldn't continue to expand and improve at the current rate and the number of new innovations would drop

dramatically and as this week proved - not everything counts on that fancy new tractor that the farmer might be thinking about buying! It was awesome to be able to get a glimpse at these geniuses at work and to spend a week with the possible next generation of fantastic scientists.



My Industry Placement

For my week of Industry Placement I was with the Cotton Growers Services (CGS) in Gunnedah where I was looked after by the Branch Manager, Carol Sanson and Kirsty, who was on holidays from her university degree of Rural Science which she is studying at the University of New England in Armidale (this was awesome because I got to grill her about life at UNE!). Even though I was up at quarter to 5 every morning to be out the door by 5:30 it was totally worth it; the sunrises I saw were stunning and beating the heat of the day was way better than a sleep in!

Due to it being mid-season there was a lot of checking involved with the crops monitored by CGS. This included beat sheeting, used to identify the types and number of insects that are living in the crops, by shaking a number of plants onto a sheet of yellow of plastic (it's harder than it sounds!). Things to look for were damaged squares and insects of many shapes, sizes and colours. This allowed me to learn some of the good guys (predators such as lady beetles and red and blue beetles) and the bad guys of cotton such as Mirid, while also learning about the effects that these insects can have on the success of the crop. Visual checks were also conducted to get a look at how the plant was progressing. Indicators of this were node length and number, fruit retention and the number of flowers above white flower, which was an indication of whether the plant was stressed. One of the most important things I learnt during the week was just how hard it is to shut down a dry land crop (this is a crop that is grown purely on soil moisture and rain). Due to the fact that this season has been very dry, it is getting to the point where the decision needs to be made to either plough down the cotton, spray it with a growth regulant to stop the plant from growing any higher so it can focus on the squares and bolls that it does have, or wait desperately for A LOT of rain. This is always a hard decision for all involved and it was interesting to see the process involved with such a huge decision that can either make or break a farmer's income for the rest of the year.

The week was an absolutely amazing experience that I would definitely repeat a million times over in exactly the same way! I am extremely grateful to Carol and Kirsty and the roles they played in making the experience a positive and informative one; if they are ever in need of a helping hand I will definitely be at the front of the line jumping up and down on the spot with my hand in the

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air, waving like a lunatic! The experience has shown me yet another path that I would definitely follow into the big, bad, unknown world.

How My Placement Influenced Me

The biggest ways my Industry Placement has influenced me is through education and experience.

Having never lived on a property, one thing I will always be disadvantaged in is experience however through my work placement I have begun to get the experience that I will possibly need for the future, while having a lot of fun in the process!!

My love of cotton has increased monumentally and my family is definitely sick of all the cotton lectures that happen every time I get anywhere near a field of cotton. However it is just my way of telling everyone just how keen I really am! I love being able to go to school and when anyone asks me what I want to do at university or after school the feeling that comes with giving them a definite answer is empowering. The experiences that the PICSE Industry Placement Program has supplied, helps me to remember every day that I have many paths to follow that will allow me to do the thing I love.

Acknowledgements

I just want to say thank you to Kay and Ingrid for all the hard work they have done for PICSE and the amazing balancing act that they performed in Toowoomba keeping everything practical, informative and engaging.

I also want to thank Cotton Growers Services who were not only welcoming but answered all my questions no matter how silly they might have sounded!!

To my fellow students I hope you got as much as I did out of the experience and I wish you all the best in your futures!

Lastly I wish to thank all of the presenters from the week, you did an amazing job and without you guys to guide us into the future I believe that we would well and truly be lost, I know I would be!

All in all the week was a great experience and learning curve; it provided me with many new roads that I could possibly follow into the future. I believe that this camp has well and truly cemented in my goal to pursue an agricultural profession.

Alexander Monk

School: **Warialda High School**

Industry Placement: **Queensland College of Wine Tourism, Stanthorpe**

> ***"This is what I want to do for a living and I think that the range of jobs exhibited on the camp was immense and diverse, all with good prospects."***

Industry Placement Camp

The PICSE camp was a once-in-a-lifetime opportunity, and one of the best decisions was to apply for the experience. I had a marvellous time experiencing many different scientific and primary industries linked careers; some of the most stand-out presentations were the Spatial Sciences demonstration and the Pacific Seeds tour. The camp was a great way to meet people and make lots of friends with an idea of looking for an advanced career in an interesting field of expertise. Many of the people I met have the motivation and the eagerness to learn that will land them with excellent prospects for the future. This camp was designed to show us a range of options available to those that the industry considers to have a track record and the zeal to help build the industry into the next generation.

My Industry Placement

My placement was to the Queensland College of Wine Tourism (QCWT), where I was associated with Peter Orr who was able to demonstrate many of the processes in wine making. Peter was capable of showing me a lot because we were only at the beginning of the harvest season. The few loads of grapes that came in were early for the season; we had a lot to work on but not enough to be overworked. This helped for me to ask questions about certain processes. When I arrived the first load for the week was delivered with about five hundred kilos of white grapes and another four hundred and fifty kilos of two varieties of red grapes (Shiraz and Pinot Noir). Both were run through the crusher and the stemming device. But the white was then immediately pressed to prevent oxidisation and to maintain the

typical profile of a white wine, whilst the reds were crushed straight into fermentation tubs to ferment the reds in their skins for a few days prior to pressing to attain a deeper, richer colour in the wines. The white was later pumped into a large fermentation vat.

Later that week we went through a process of testing the Baume (sugar levels that convert to alcohol) and the temperature to find the moment to add new yeast to increase the fermentation rate. The new yeast is more efficient compared to the natural yeast that comes already settled on the grapes. The yeast takes the sugars (glucose and fructose) and turns them into heat, alcohol and CO_2. The thing that confused me is that when yeast makes alcohol it is no benefit to the yeast, and can kill them in the end by poisoning them with ethanol (alcohol capable of being consumed by people).

On the Wednesday we spent some time in the classroom where we did several tests such as exact pH and a titration to test the levels of acids and the colour development. Later we mixed up some fermented whites to perform fining trials with Casein (a milk based colour and taste regulator), isinglass (fish based polishing agent), and polyvinyl poly pyrrolidine (that enhances bitterness and colours). These tests were of varying concentrations to be tested on colour, nose and palate. Peter Orr tested the concentrations and assessed that none of them overly improved the wines' profile or quality.

During the last day we went through the process of bottling by using a simple machine that relies on a gravitational drain into the bottles from a large storage container. Then after the bottles are filled with an inert gas that prevents oxidisation of the wine whilst exposed to an open environment, they are lifted into a spring-bound nozzle that releases the wine from the storage into the bottles, whist letting out most of the gas save for the little bit in the top of the bottle to stabilise the pressure in the bottle. The bottles, after being filled, are then capped using a capping machine that is designed to secure a screw cap to the top of a bottle. The screw cap is better for a bottle of wine than a cork. Cork can give out flavours and a scent that is usually considered bad for the wine in question because it can alter all the good parts to a wine and make it a bit tainted. After capping the wines the next step was to label them with the Banca Ridge label. The labels come on rolls that are then stuck to each individual bottle by a machine that spins the bottle and lines up the labels directly opposite each other on the bottle. I learned that everything that is used in the process has to be cleaned thoroughly and cleanliness is very important in this industry.

How My Placement Influenced Me

This placement has reinforced my desire to enter into the wine industry and has allowed me to see first-hand how hard it is to enter this branch of the industry. I have experienced the growing side, in a previous work experience and while it is good to know about it, it is not what I wish to pursue as a career. This is what I want to do for a living and I think that the range of jobs exhibited on the camp

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Acknowledgements

I would like to thank: Peter Orr and the staff of QCWT, for being willing to take on a work experience student; also Kay Lembo for working hard in finding work experience and coming to check up on us; the USQ campus and staff as well as the people who work in keeping all the stuff working for the camp; and the Australian Government and other industries associated with the PICSE camp for helping to make the camp capable of helping all the talented students keen to enter the agriculture and science industries, to get first-hand knowledge of the industries; and finally those students who are accepted and put in a lot of effort to be at that camp and enter the industry.

was immense and diverse, all with good prospects. Although I believe that wine making is for me and I hope that all those who participated in the camp have found something they enjoy or feel that they have found something else they enjoy in process. To enter into the industry I wish to complete the wine science course at University of Southern Queensland (USQ) then build my way from there …

Nicola Onus

School: Narrabri High School

Industry Placement: Commonwealth Scientific Industrial Research Organisation,

"Although I am still not certain on which career would suit me best, the PISCE camp and the work placement has made me focus on what I need to do to get where I want to be in the industry."

Industry Placement Camp

When the PICSE (Primary Industry Centre for Science Education) camp began, I was very nervous. I didn't really know what to expect. Although having a small group of fellow classmates that had also been selected for the program did help ease the nerves.

Our first activity was on campus in one of the laboratories. All of us students were able to get a small glimpse of what was in store for the next week and we were able to get to know one another throughout the first day.

I was surprised by what there was to learn over the course of the week. There were so many activities crammed into each day; I really don't understand how we got through them all! Each tour guide was very thorough in the details of their industry they worked in and answered every question that we threw at them - no matter how absurd.

My Industry Placement

The second stage of the PICSE program was industry placement for one week. I chose to do mine at CSIRO, (a cotton research centre). For that week I spent most of my time in the laboratories. I worked with several CSIRO researchers, helping them with their projects. When I arrived off the bus, Trudy; the Technical Officer, was very welcoming, introducing me to some of the other employees before I was given an induction.

All of the workers at CSIRO answered my questions and gave me a quick run-down on the variety of projects that they were working on at the time.

Every day I was assigned to a different researcher in their laboratory. They kept my experiences varied and made my time there as valuable as possible. Throughout the course of the week the work areas I was

placed in included; breeders, Genetics in DNA/ELISA (enzyme-linked immunosorbent assay), Pathology, Agronomy and Entomology.

Every day held a new surprise; I had the chance to experience tests that I had never done before. I was put at ease each morning because of everyone's friendly nature, I found it easy to get in to the flow of things, Everyone in the laboratories were more than willing to make me feel involved in their research. They took the time to explain what they were doing and the process of doing that. I loved the fact that they were willing to let me help with their research which could change something in farming cotton in the future.

How My Placement Influenced Me

I visited a diverse range of interesting places on the PICSE Industry Scholarship Program. This program has shown me so many opportunities. I feel an overwhelming relief, surprisingly in knowing how many kinds of opportunities there are out there because in my future, I can only see myself in a career in agriculture that includes science like Environmental Science or Rural Studies.

I found it reassuring that there are people out there who are eager for senior students interested in science, to succeed and do further study. The thought of finishing school is an overwhelming thought at times, I feel comfortable knowing that the choices I make after high school will direct me towards my future career in the industries.

Now that the camp is over, my gratitude goes out to everyone who made this unforgettable experience happen. Although I am still not certain on which career would suit me best, the PISCE camp and the work placement has made me focus on what I need to do to get where I want to be in the industry.

Acknowledgements

Thank you for the experience of the placement scholarship, there are a great number of people to thank for this. Firstly, I would like to thank Kay and Ingrid for answering all of my questions and concerns and for the constant flow of email reminders, without the both of you I never would have been able to keep myself organised.

I'd also like to thank all those who allowed us students to visit their industry, for preparing a tour or presentation for us. You deserve our utmost thanks; our experience at the camp was amazing because of the consideration and effort shown to us in every industry we visited.

Finally I would like to thank the University of Southern Queensland Faculty of Health, Engineering & Sciences, the Australian Government, CSIRO, Cotton Research and Development Corporation and my agriculture teacher - without her my classmates and I wouldn't have known about PICSE. These are only a handful of people who deserve our thanks; there are many more people who deserve our gratitude.

Marlee Palmer

School: **Narrabri High School**

Industry Placement: **Bribie Island Research Centre**

"The week's work placement opened my eyes to aquaculture, which at first … I was not that keen, however … I really enjoyed it; it's the little things like this that can make a huge change to our life - this just so happened to be one of those moments."

Industry Placement Camp

It felt like I was in kindergarten, starting school all over again, jammed onto a bus full of people who I did not even know. However, this time I did know some of them and it was a lot easier to climb onto the bus knowing they were taking this journey with me. Myself and others from my school all travelled up to Toowoomba on a mini bus, picking up few on the way, we had started a journey that would change our perspective on our future forever. Once having arrived at the campus we were then introduced to Kay who I had had my interview with, myself and others from my school were all given our rooms we would be in for the week, and made ourselves at home. The following day came and many more students walked through those University of Southern Queensland (USQ) doors also hoping to have a glimpse of what their future is going to look like.

After everyone was all settled in, we all were met by Ingrid Gow at the Steel Rudd College to be given a welcome and a program induction. Once we were all aware of the week ahead of us, we all set off to the labs at USQ where we were met by Noel Knight. We then conducted plant genetic extraction, we all were paired up and continued out this practical. Coming from a small rural school I had never actually done, heard of or seen a plant genetic extraction, so for me this was very unusual. Surprisingly I enjoyed it; being paired up did help a lot as I was paired up with a young girl called Grace who wanted to do a career with plants. As she did know a lot about the process, she was kind enough to help me with each stage of the genetic extraction.

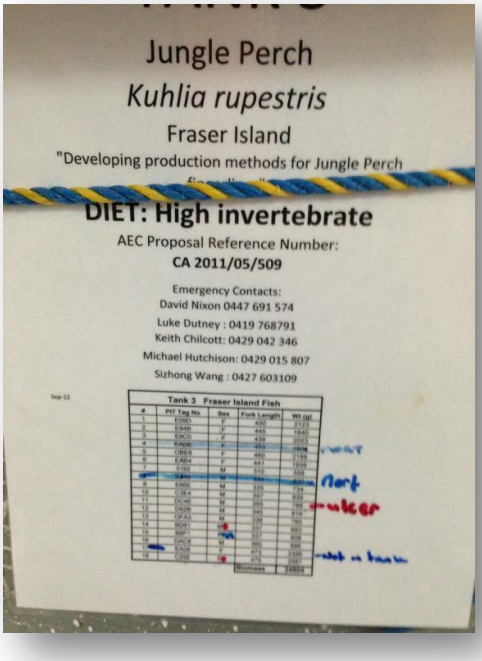
After we completed the process in our small test tube you could see the DNA. It appeared to look like a cloud floating in the middle of a test tube filled with water.

The week at the university involved many amazing things, where we all got to see a variety of different sciences in front of our own eyes. Personally I wished I could have stayed there for a lot longer than a week as it was both educational and inspiring.

My Industry Placement

The second part of the PICSE program was an industry placement. I struggled choosing where I was going to spend my week's placement as I was very interested in marine sciences (Marine Biology) and not many industry placements actually involved marine biology. However my agriculture teacher, Mrs. Partridge, did end up picking one for me that she thought would take my interest. It was studding aquaculture at the Bribie Island Research Centre. I arrived at my placement at 7am not knowing what I had got myself into, thinking I would slowly start to getting involved was a huge mistake. I was thrown right in to the deep end. The Bribie Island Research Centre are currently doing a project on Jungle Perch, studding the spawning rates and their breeding process in captivity.

On my arrival I was sent straight to the Jungle Perch tanks to help out with the spawning process which is very rarely done. Firstly I lowered the water levels of the tanks so the fish had a lot less room to move in, measuring how much water was left in the tank would then tell myself how much AQUI-S solution to put in to the water (AQUI-S is an aquatic anaesthetic, it slowly puts the fish to sleep which allows them to be taken out of water and to be handled). Once the AQUI-S solution was added, we (myself and others) waited as the fish slowed themselves down into a deep sleep.



Grabbing the larger fish first, as AQUI-S knocks them out quicker; we examined them to see if they were male or females. If it was a male it would be milked to see if it was a good specimen to be breed from, however if it did not have any milk it would go into the rejection tank and no longer tested for spawning but instead, for diet trials. The female fish however were checked to see if they were fertile or not. A very fine tube was inserted into an egg sack of the female fish and sucked out eggs to see if the female was fertile or not and if they were, she would be injected Ovaprim a hormone to tell the fish to spawn, once injected into its body. Depending on the fish's size we would estimate how much Ovaprim hormone it would be given. For example, if the Female Jungle perch weighed approximately one kilogram then it would be given 1ml of Ovaprim hormone. If the female, however, had no eggs it would also be put into the reject tank for diet trials. Once this process was done, all fish were weighed and measured to update all previous weights and lengths.

Placing the fish into clean fresh water killed the antiseptic and all fish slowly returned to normal. If the fish were spawning however they were placed into salt water as Jungle Perch breed in salty water but live in fresh water. And the reject fish were placed into their original tanks. The spawning process takes up to 48 hours.

Once the fish had laid their eggs the eggs would then be collected by an egg catcher in each tank. A small specimen of egg from each tank was taken and examined, with this process taking up the entire week so unfortunately I was un able to see the eggs hatch.

How My Placement Influenced Me

The PICSE industry scholarship program has shown me a totally new world of Career opportunities. I never knew were involved in marine Biology, it feels amazing just to know there are so many kinds of opportunities there are for science students or graduates in rural areas like Narrabri.

Now that both the camp and the placement are sadly over, I do have to start thinking about my future. With still almost a full year of school left for myself, I do have more time to think about what direction I want to take my life into. I definitely am still wanting to do marine Biology but not at such a large scale.

The week's work placement opened my eyes to aquaculture, which at first I will be honest I was not that keen, however once I had my first day I had surprised myself; I really enjoyed it, it's the little things like this that can make a huge change to our life - this just so happened to be one of those moments.

For example PICSE is just a small group of people that were willing to help me and others so for that I am very thankful for the week's work placement that PICSE has entered into my life; I now have a larger portion of sciences I would like to choose from. However while I am still not entirely certain of which career is best for me , I do have a greater understanding of what consequences and opportunities provide me with any future choice I make in my study.

Acknowledgements

Firstly I have to thank my Agriculture Teacher Mrs. Partridge; without her myself, and many students from our school would not get this unique opportunity. Not only did she make us aware of this opportunity she also took up her own time to help us get ready for the long week ahead for which we all were excitedly waiting.

I would also like to give a big thank you to Kay Lembo and Ingrid Gow for their outstanding patience and co-operation throughout the camp week; looking after us all would have been a nightmare but these two women did it like it was nothing so thank you. Kay also supplied myself and 11 others transport to get from Narrabri to the university at Toowoomba.

Thank you to the following: Pat McConnell, Noel Knight, Mark Lynch, Jeffery Schrale, Loe Stanford, PhD Students, Toowoomba Toast Masters, Glen Campbell, Tricia Skele, Brendon Griffiths, Leonard Jarick, Roger McQueen, Ian Daniels, Andrew Easton, Kym Deaves, Helen Kamel and Julie Boulton who took up their own time to give myself and the other PICSE students their knowledge of sciences and giving presentations on what they specialize in.

Next, a big thank you to all the students; without them I don't think there would be a camp to go to; everyone had questions and ideas that were both amazing and inspiring, every day I think we all learnt something new, we also made many friends that week so again another big thank you.

Finally a big thank you to Peter Lee and his staff at the Bribie Island Research Centre, you all made my week worth going for I could not have asked for a better group of people to work with than the staff. Especially one staff member Keith Chilcott; not only did he look after me at the work place, both him and his amazing family took me in for the week and looked after me - they made me feel right at home, I was treated as a family member and to me that is pretty important, so thank you.

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Jessica Scaysbrook

School: Narrabri High School

Industry Placement: Ecoscience Precinct, Brisbane

> ***"Overall, it was a great week, I learned so much … The PICSE camp and placement was so influential I had such a great time meeting new people and learning about the science in agriculture."***

Industry Placement Camp

The night before the PICSE Cotton camp began, I will be honest, that apart from being in a different state with a different time zone I really had no idea what to expect. The next day came so quickly and as new faces started to arrive I felt more at ease, however it was good to have the support of friends from my own school.

The camp consisted of visiting many industry businesses growing our knowledge of what happens behind the scenes of these industries. It was a real eye opener as to the amount of science that is used to make the Primary Industries of Agriculture productive and profitable. As most of you know science is in almost everything from making bio fuels to growing a crop or even being able to wash ourselves in hot water without heating the water ourselves. Science has been there in some way or another making our lives easier. With easier lives comes easier ways to make money and happier people (sometimes).

The industries that we visited were great. I loved being able to do all the hands-on learning for example; We were taught how to do DNA extractions in the University of Southern Queensland's laboratory; when we went to the cotton farm we got into the fields checking for beneficial insects and insects that can destroy a whole crop; taste testing the nuts at the nut industry (that wasn't exactly learning but still was a highlight); looking for sorghum midge eggs under a microscope by dissecting the sorghum seed heads (I found 4) and looking at *Heliothis* under microscopes, and separating them into their own individual meals at Monsanto.

My favourite industry that I visited was Monsanto. The work that they are doing is not being generally accepted by cotton farmers who don't understand how they are helping them deal with *Heliothis* that have become immune to the GM cotton. I was the same being off a cotton farm but I was really impressed to see what they are doing in their

approach to tackling this resistance. If that was the only thing I took away from the camp that would have been great but it wasn't luckily.

We went to a cotton farm where they were irrigating and bug checking. This reminded me of home and it was good to see how other people farm their land not that there was much of a difference; this would have been great learning experience if I had not been previously exposed to the workings of a cotton farm.

The camp was very influential on me and gave me ideas on what I might want to do when I leave school at the end of this year 2014.

My Industry Placement

I went to the Ecoscience Precinct in Brisbane. The week I spent at the Ecoscience Precinct was in the Rumen Ecology Lab, working with scientist helping the different people on their projects. The first day I was assigned to a scientist working on amplifying DNA who let me assist with her Polymerase Chain Reaction (PCR) setup. Then she was able to show me how to run PCR's on a gel which is a visual of the PCR product. We did the post PCR cleanup and there are many steps to make this one step work properly. It requires 72 replications.

The next day was even more interesting - I learnt about the anaerobic bacteria, *Synergistes jonesii* which is a bacterium that breaks down a non-protein amino acid called Mimosine which is a toxin that is found in the Leucaena plant.

This plant is a fodder tree that livestock do really well on but it's poisonous and this laboratory specialises in the production of the bacteria to sell to farmers as a drench which therefore enables the livestock to feed on the plant. Livestock can have up to 20% of the plant in a mixed diet but if the animals eat more than that they start to get side effects.

Some of these issues consist of: neurological problems; hair loss, tail tuff; loss of weight and then the unfortunate issue is they can die from this plant.

As the week went on my brain was almost ready to explode and then they continued to fill it more and more. There were a lot of people I talked to who were very beneficial on giving me ideas as to what I want to do after high school. One of these people that gave me a lot of advice and encouragement was Felicity.

Some other things I did and learned were how to do roll tubes that are used to culture bacteria. The tubes are anaerobic so they contain no oxygen whereas the normal agar plates do and since this bacterium is oxygen sensitive, it will die if exposed. The way these are done is the agar is melted in the tube with a rubber stopper in the lid; a small amount of the bacteria broth culture is

diluted and is then inoculated into the melted agar tube. The tubes are then rolled on a roller with ice until agar is set. This combines the bacteria with the agar instead of it just growing on the top of the agar plate.

I also was able to use the anaerobic chamber to help make some more cultures and microscope slides; these cultures were just inoculated into a broth media (a liquid). The anaerobic chamber is a chamber which is used to do anything with the bacteria. It contains no oxygen and has a gauge that shows if there is any oxygen present in the chamber.

On one of the last days I talked to a man named Richard Silcock who works with pastures and he was very helpful and I learnt a lot from him about the plant called Pimelea and how it has a toxin in it called Simplexin. It was very fascinating in how it affects livestock, mainly cattle. They did an experiment on it and put a percentage of the plant in a mix and the percentage went up and they found the plants started to get sick at one point but they still kept increasing the amount and the plants improved as if they became immune to it. This is something I'm very interested in!

Overall it was a great week I learnt so much!

How My Placement Influenced Me

The PICSE camp and placement was so influential I had such a great time meeting new people and learning about the science in agriculture. It was a very informative camp. The program as a whole has left me with a lot of new knowledge and things to think about. I am most appreciative to be a part of the great program.

Acknowledgements

A thank you to: Di Owerkerk for letting me stay at her house; Kay for organising everything; the Queensland Government; all the industries that allowed us into their workplaces. AND a huge thanks to all the people that were behind the scenes: the ones who fed us; the people who drove us to the camp and the USQ College we stayed in; Mum, who drove me to Brisbane, and all the scientists who let me tag along with them.

Grace Scott

School: Model Farms High School

Industry Placement: Hawkesbury Institute for the Environment, University of Western Sydney

> ***"[I've changed] my preferences to an Advanced Natural Science course with UWS ….Without the placement and the experience from the PICSE program, I would have moved six hours away from home for virtually no reason."***

Industry Placement Camp

My PICSE journey began as a flight to Toowoomba - all the way from Sydney! Our week in Toowoomba involved visiting many businesses and laboratories involved in primary industry and science. These seemed to be mostly about plants and I really enjoyed this; I learnt about future options for careers and university degrees.

At USQ we were shown how they extract DNA from wheat seedlings. We learnt about plant pathology and lots of interesting facts, like that most cereals are originally from Iraq and all bananas are genetically identical.

It was amazing to learn about how many places a career in plant science can take you and how our guest speaker Noel had travelled to many parts of the world to do his research.

I was also surprised to find that even though I thought I had no interest in finance and commerce, the Agribanking session we had was fascinating and opened my eyes to the Asian market of Australian agriculture.

Spending time at external companies such as HFSP was also great, where we learnt about the analytical side of primary industries. The haematology, food technology, biosecurity and aflatoxins and pesticides labs were really interesting. Similarly, the Pacific Seeds company was great and we learnt a lot about the different grains that they produce and how they produce them.

My Industry Placement

I had my industry placement at the University of Western Sydney's (UWS) Hawkesbury Campus. It started out by meeting April and Chris who were to become my go-to organisers and programmers. April and Chris

were both amazing organisers and had tailored my visit perfectly to my interest in plants and the environment. I would be spending two days at The Hawkesbury Institute for the Environment where they test the predicted effects of climate change on plants and two days in Dr Zhong Hua Chen's laboratory where he was carrying out testing for salt tolerance in genetically altered barley. I knew already that I was in for a great week.

From April and Chris, I was sent directly to the Hawkesbury Institute of the Environment (HIE) where Burham gave me a tour of the Whole Tree Chambers where they are currently exposing Eucalypts to raised temperatures to test how they will react to the predicted climate of 2050. This is carried out in giant plastic chambers, on loan from Sweden, and monitored very, very carefully using Li-Cor machines, gas analysers, and even ring-like instruments which measure the swelling of the tree trunk that I helped Sebastian fit. Ellie, an honours exchange student from England, took me to her green house where we watered her experiment with carefully measured amounts of water to see how native plants will react in the predicted droughts of 2050. They also have giant scaffolding type structures that blast an entire native ecosystem with millions of tonnes of carbon dioxide which I was taken up in a crane to see. This is called the EucFACE (Eucalyptus Free Air CO_2 Enrichment) and we took cuttings from some of the Eucalypts to assess how well they were transporting water. Chelsea also showed me the eddy-flux station which measures the amount of carbon dioxide that comes off a native ecosystem and how this information can be used to determine whether the forest is respiring or photosynthesising. We also looked at rain-out shelters which are mechanically controlled to respond to rain by rolling out covers so that researchers can simulate drought in an otherwise completely natural ecosystem. This was all really interesting to me and to see the intricate precision that these experiments were carried out with really opened my eyes to scientific method.

The two other days were spent in the laboratory with Zhong Hua and his research partners Michelle, Mohammed, Fei Fei and Xiaohui. Zhong Hua explained that we would be doing a few experiments with a plant called Arabidopsis which acts as a model plant for genetic experiments as it has a relatively short genome and a short reproduction cycle. I spent time with Fei Fei preparing the soil and seeds and putting the smaller-than-sand-grains seeds into the soil using a pipette. Mohammed also showed me how they weigh the dried biomass of the barley plants they are testing- the scales are so sensitive and accurate that you can't use a fan around them! Michelle taught me how to do a "peel" of a leaf to obtain a sample you can use on a microscope and then how they use these samples to look at stomata. Measuring the size and openness of stomata is a good indication of how well a plant is coping with stress and Michelle collects this data to analyse how salt tolerant the barley is. She has collected over 3000 lines of data.

April and Chris also took me around campus to look at other things, and we spent an afternoon in the reptile and mammal house

with turtles, jumping mice, bearded dragons, frill-neck lizards and a giant python called Scarf. We checked out the Earthcare site which is a completely sustainable centre where they grow their own vegetables and have gardening workshops. We even checked out campus accommodation. UWS was the nicest university I've ever been to; my industry placement was definitely a positive experience!

How My Placement Influenced Me

After spending a week at UWS and loving the campus and the attitude of the people there, I decided to reject my offer to UNE Armidale and change my preferences to an Advanced Natural Science course at UWS. I have been lucky enough to have received this offer and will be moving into campus accommodation soon. Without the placement and the experience from the PICSE program, I would have moved six hours away from home for virtually no reason.

I am also volunteering once a week at Dr Chen's laboratory, where I assist Michelle in collecting the stomata data. This will mean that I will be put as one of the co-authors on a scientific paper on salt tolerant barley and will gain valuable research experience.

My placement really opened my eyes to the scientific work that was going on right in Sydney and also inspired me to take the opportunities that are offered right here.

Acknowledgements

I would like to thank a number of people for their time and effort. Firstly, our camp organisers Ingrid Gow and particularly Kay Lembo went above and beyond for us in organising everything from accommodation, to food and even getting me to and from Toowoomba (not an easy feat!). Thanks to the industries who found time to accommodate our PICSE group and give us tours and presentations.

I would particularly like to extend my thanks to those at UWS. April and Chris organised my visit so perfectly and were so accommodating and nice! Similarly those at the HIE taught me so much about experimental technique and I hope to head over again once my degree starts. Finally, I would like to express my gratitude to Zhong Hua, Michelle, Mohammed, Fei Fei and XiaoHui. You have all taught me so much and it has been lovely to work with you; thank you for having me in your lab and making me feel so at home.

Tenayah Woodward

School: Narrabri High School

Industry Placement: Australian Cotton Research Institute, Narrabri

"This program and the ACRI have put many puzzle pieces into place, and shuffled my path to the future around. Where I see myself in the future isn't quite what I imagined, instead it's better."

Industry Placement Camp

All my life I dreamed of becoming a Veternarian, I was an animal girl through and through and the plant side of science was never my forte'. But it was all just a dream that I had no clue how to reach, only that I was going to. When I learnt of the PICSE program I was still so headstrong to a life in the animal industry, but one of my PICSE coordinators Trudy Staines believed she could convince me otherwise. I was determined to gain a place in the PICSE program, I felt this would be the perfect opportunity to help put many puzzle pieces into place and make my dream seem reachable.

When I received my successful email from Kay Lembo, another of my PICSE coordinators, I was so excited that I forgot to return a confirmation email. I guess you could say that that wasn't the best impression made on my behalf, but it was an extremely exciting moment! All I could think of was 'great, now she will think I am the biggest goose.' Typical me.

The week of camp came flying around and panic kicked in as I had no idea what to expect. I was so worried that the plant side of the itinerary wouldn't interest me - little did I know I was about to be proved wrong. Not one lecture, activity or demonstration lost my attention, and my fascination with science grew with my many new friendships. Although I did find that I could never quite write notes as fast as I would have liked to.

As the camp kicked off with some DNA extractions and careers in agriculture lectures, all my previous worries diminshed. I realised I was surrounded by people who were just like me; Science crazy! I felt completely at home,

and excited for what the rest of the week had to offer.

As the week progressed I leaped my way from place to place along with my 27 new PICSE friends. From demonstrations and lectures at the University of Southern Queensland (USQ), to tours of the biosecuity labatories in Brisbane, to touring farms, going bug hunting and gazing up into the stars. Not to mention many exciting tours at places such as Vanderfield, Pacific Seeds, Monsanto and the many nightime lectures ranging from careers in agriculture, to public speaking.

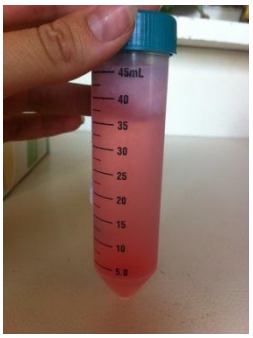
Although all too soon it was our last night at USQ and the end of the PICSE camp was so close. Our last nightime activity consisted of constructing robots and programming them to navigate around a maze. The mysterious 360° spins many robots demonstrated seemed hilarious to the drained minds of each PICSE student. As difficult as it seemed, my group managed to navigate part way around the maze before we were almost asleep. Suddenly I realised that no matter how hard something may seem, it's probably not. You can do whatever you set your mind to.

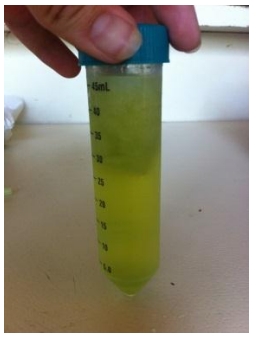
I knew that once our last activity ended at the Hermitage Research Centre I was going to miss the camp and all the fantastic experiences it brought. Before long we were making our way back home, but with me I took so much knowledge and memories that I knew would be unforgettable.

My Industry Placement

It then came time to choose my industry placement. At first all I wanted to do was go somewhere where I could work with animals, so a Diagnostic Laboratory in Armidale seemed like the most perfect opportunity. Unfortunatly, Rad Nielsen was unavailable for any workplacements at the time so I decided to give the plant industry a try. Little did I know that my second preference at the Australian Cotton Research Institute (ACRI) should have been my first choice all along. As an animal mad girl I'm sure I would have enjoyed working in the Diagnostic Lab, and decided to complete two work placements by also returning to the biosecurity laboratory in Brisbane. Unfortunatly I was unable to make it back up this holidays, but I intend to in the coming holidays to do some work with David Waltisbuhl in the Diagnostic Laboratory.

My week consisted of DNA extractions with Marylin Smith where I was able to extract not only my own DNA but also that of a strawberry and kiwifruit, which I took home with me. Although I was, my mother was not so fascinated by the tiny litle strands of DNA floating around in the test tube, nor was she to thrilled that I was storing them in the freezer.





I then became a Plant Pathogist for the day with Karen Kirkby. I was taken through the stages of a plant disease, in particular Black Root Rot. I was then able to view not only the damage of the disease to the plant under a microscope, but also identify the pathogen and its characteristics. Although I enjoyed each moment I spent at ACRI, I must admit that Day 2 with Karen was my most favourite. I could'nt be more thrilled when she offered me holiday work, and she couldn't be more thrilled when I announced I would like to return for the rest of the holidays – paid or not paid.

Wednesday and Thursday consisted of mostly field work which I loved, as I love being outdoors. On Wednesday I was shown the affects of different climatic conditions on cotton crops with the Agronomy team. This put into perspective the reasons behind creating a genetically modified crop, and what the team were aiming to create resistance against.

Thursday followed up on the plant breeding that was currently in action at ACRI. I was lucky enough to have a presentation prepared for me by Warwick Stiller, who spent two hours explaining to me the plant genetics and what they were trying to achieve in the plant breeding project. Seven pages of notes later and my mind was still buzzing with questions, that Warick made sure didn't go unanswered. The rest on my day was spent with the Plant Breeding Team pollinating cotton crops, and although it was extremely hot it was also extremely rewarding and I learnt a lot from the team.

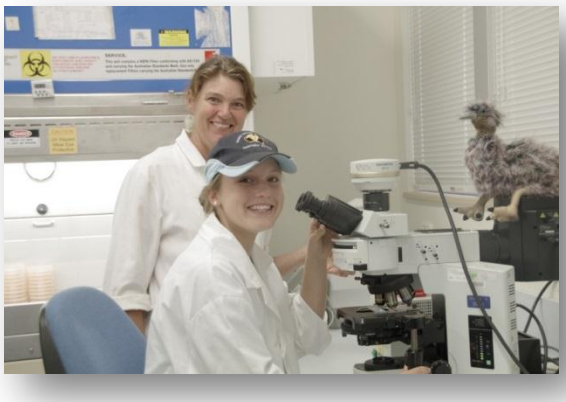
Friday consisted of half field and lab work with the Entomology Team. My morning was spent sliding around in the mud trying to find tiny white *Helicoverpa* eggs on crops such as Cotton, Pigeon Pea and Maize. These were then taken back to the lab and placed on diets where they would grow and be used in experiments. The second half of my day was spent seperating 2nd stage larvae from pupa. Not only did I learn the growth stages of the bugs , but I also learnt of the testing done and the genetic modifications made to create resistant bugs and therefore improve the cotton industry.

How My Placement Influenced Me

All in all, working at ACRI was one of the best weeks I have spent.

Acknowledgements

Thank you, Thank you, Thank you! To the PICSE program, you have my utmost thanks. My thanks also extends to my PICSE coordinators Kay Lembo, Ingrid Gow and Trudy Staines. Much amazing work has been done by these ladies to make this program possible and I am so thankful for your constant support. I would also like to thank the University of Southern Queensland and all those who prepared presentations or tours for myself and the rest of the PICSE students to attend during our week on the camp. It was all so worthwhile and I truly appreciate all the effort you all went to.



Last but not least, thank you to everyone I was lucky enough to work with at the Australian Cotton Research Institute. I learnt so much from you all and had the most amazing week. Each and every experience was incredible and I look forward to working as part of the team each holidays.

This program and the ACRI have put many puzzle pieces into place, and shuffled my path to the future around. Where I see myself in the future isn't quite what I imagined, instead it's better. I may even be a plant girl now, and my dreams are closer then ever.

Johanna Nielsen

School: **University of Southern Queensland**

Industry Placement: **Australian Cotton Research Institute, Narrabri**

"I found my short visit into the world of plant pathology fascinating! As a result I am now rearranging my enrolment pattern so I can study USQ's Microbiology courses as part of my biology major."

Cotton Industry Placement

This year (2013) I have been fortunate enough to receive an undergraduate industry scholarship at the Australian Cotton Research Institute (ACRI) in Narrabri. My preferences for the type of work were plant pathology, nutrition and agronomy and spent my week in the plant pathology department. My mentor in the plant pathology department was Dr Karen Kirkby, who was on leave at the time but generously came in on Monday to meet me and tell me a little about how she came to be working in the cotton industry.

Dr Kirkby is currently researching the effect of soil types and soil pH on black root rot. The pathology team is currently setting up an experiment on black root rot spatial variation: pots will be filled with pasteurised soil, 21 seeds planted and the middle seed hole will have 0.7mL of black root rot inoculum added.

After 28 days each plant will be assessed to see if the black root rot has spread and if so, how far. If the black root rot pathogen has not spread to surrounding plants this will suggest that the pathogen does not spread naturally but is spread by ploughing.

During the week I worked primarily on black root rot *(Thielaviopsis basicola),* which causes slow, stunted growth in young plants, and worked through the process of isolating the pathogen to producing clean cultures. This gave me the chance to isolate the pathogen from infected roots and onto split carrots, subculture from the infected carrot onto TbCEN media plates and subculturing on to carrot juice agar – the cultures are subcultured up to five times to produce a clean culture suitable for long term storage. I made black root rot inoculum from a culture which was then used to count the chlamydospores, chain and fragments (ccf) - in 200mL of inoculum I calculated there to be 18560 spores! I also made carrot juice agar for the culture plates and took the pH of soil samples.

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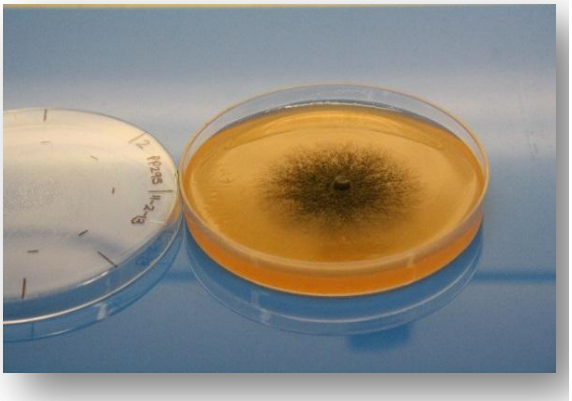

Completing my industry internship during the 16-20th December meant it was a quieter period for the pathology department and there was no field work, which would have been interesting (and busy) work. For 30 years ACRI has completed bi-annual disease surveys throughout NSW cotton growing districts, the early season survey is conducted during October of November with the late season survey being completed prior to picking in February or March. In the surveys the incidence of Fusarium wilt, Verticillium wilt, black root rot and Alternaria leaf spot is assessed and the severity thereof. Completing these surveys over a number of years has helped identify trends and relationships between the incidences and severity of cotton diseases in relation to changes in Australian farming practices; for example it is evident that the incidence of Verticillium wilt increased after the adoption of no-till practices in Australia.

The week in Narrabri reinforced the message I had already learnt in my high school industry placement, that scientific research isn't quick. It is long term, it may take years to find solutions to a problem, and as such it is a long term career. I know that all jobs have parts that can be monotonous, so weighing out samples of soil or cleaning up after experiments seems preferable to the 'boring' parts of many of other industries. And the fact that you are contributing to amazing research that will lead to a positive change for the future of agriculture in Australia makes it worth it. I had the opportunity to speak Dr Stephen Allen, a leading cotton pathologist, and found his passion for plant pathology after so many years working in the industry, inspiring.

When I first thought of scientists working in the cotton industry my first thoughts were of plant breeders, biotechnologists, chemists and agronomists, I had never even considered plant pathology but I choose plant pathology as my first preference even though I had no knowledge of microbiology or pathology, it sounded interesting. I was correct; I found my short visit into the world of plant pathology fascinating! As a result I am now rearranging my enrolment pattern so I can study USQ's Microbiology courses as part of my biology major. Will I be working as a plant pathologist in the near future? It is definitely an option for me now. I cannot that my mind is completely made up, but the idea of a career as a plant pathologist, and the cotton industry as a whole, is quite appealing.

As one of the first participants in this new program I would like to make a suggestion which I believe would improve the experience: that the length of the industry internship was increased to two weeks. The

participants could then perhaps complete a week's placement in two separate departments at ACRI, allowing them to see the vast range of opportunities and careers available in the cotton industry.

Acknowledgements

I would like to say a huge thank you to those who made my placement in Narrabri possible. Firstly to Kay Lembo of University of Southern Queensland who keeps me updated on opportunities such as this; Trudy Staines for her part in organising this; the Cotton Research and Development Corporation for funding this internship and the ACRI pathology team who were wonderful to work with and willing to answer any questions. Thank you also to Sandy Young, my excellent host who was a fabulous advocate for the Australian cotton industry.

Stirling Roberton

School: **University of Southern Queensland**

Industry Placement: **Namoi Cotton, Aquatech Consulting, Cotton Seed Distributors, Narrabri**

> ***"After the internship, I realised how much career potential there is within the industry, and as an aspiring Agricultural Engineer, this excites me a great deal."***

Cotton Industry Placement

I received an internship through PICSE in the cotton industry for five days in February of 2014. The experience was great for me to get a feel for the industry and see the vast amounts of opportunity that it holds. During the five days in Narrabri, I was exposed to different areas of the industry, including two days at Namoi Cotton's Yarraman Gin, two days at Aquatech Consulting and a day at Cotton Seed Distributors (CSD). Spending time at multiple different sites gave me the opportunity to see how different areas of the industry interrelate, and how the all depend on each other to help make the industry as sustainable and viable as possible, and as an aspiring Agricultural Engineer, this was quite insightful.

The first two days was spent at the Yarraman Gin, where they are currently in their maintenance stage of the season. This was a great time to see the gin, as all the machinery was pulled apart and I could see the inner-workings of the ginning stands, which I found extremely interesting and informative as an engineer. One thing that amazed me, however, was that today's cotton Gin hasn't really evolved since its original design decades ago. There have been minor changes here and there, much depending on the individual Gin, but the overall ginning stands haven't been modified significantly as they work quite efficiently and effectively the way they are.

It goes to show the great innovation in its initial design without the amounts of technology that we have today. There has been some modification on the input side of the ginning process however, with the move from modules to round bales.

As an engineer, it was also great to see the gin in maintenance as this really enforced the

understanding that we need to design machinery with maintenance in mind. Too often, engineers design machines and components without maintenance consideration, making it extremely difficult and timely to fix the machine when something goes wrong. During ginning season, the plant can't afford down time, as this is ultimately wasting money as employees are getting paid whilst waiting for the Gin to start up again. When something goes wrong, the problem must be fixed as quickly as possible, which means the machines must be designed so its key components can be easily accessed and replaced. This is a key step in the engineering design process.

One of the jobs I was working on whilst I was there was tapping screw threads for the new ribs that were to be installed in each gin stand. These were designed to fit more ribs and therefore more saws in each stand. This makes the ginning process more efficient as greater amounts of lint can be removed from the seed, leaving the seed cleaner and producing a higher yield. By having more saws, the gin is also able to operate at a higher throughput, meaning more cotton can be processed in less time, which ultimately means greater profitability and efficiency.

Another component of the Gin that caught my attention was the press pins that are used to press the ginned cotton into its bales. These pins are under great amounts of stress during operation. Through some of my courses at university, I have developed an understanding of fatigue strain, where steel deforms under repeated stress, and can fail unpredictably. I was told that previously, in another gin, the head of a press pin had sheared whilst pressing, shooting through the roof and becoming a deadly projectile on its descent. At the Yarraman gin, they get a professional to check the structural deformation in each pin annually, and assess whether they are safe to use or not. I was told this wasn't an industry standard, but they do it so safe guard themselves. After hearing this, it made me wonder whether or not there are, or should be some industry standards to test key components that are under repeated stress on a regular basis, such as the cotton press pins, to reduce hazards and costly unpredictable component failure.

The third and fourth day of the internship was spent at Aquatech Consulting, who specialise in the design, investigation and construction supervision of water resources and irrigation projects. It was quite interesting to see the work done to help improve on-farm water efficiency and use. Whilst there, I developed an understanding how crucial it is to be able to design systems which improve water efficiency, especially in times of drought, like the current conditions. With this key focus in mind, Aquatech has developed two technologies/devices that aid in increasing on-farm water efficiency use. These are called Irrimate® and Water-Track™.

The first step in trying to increase efficiency is to first identify where water losses are being made. The Irrimate® software does this by collecting data which is used to create a water

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mass balance, and identify how much water is being used and how much is being lost to deep percolation, evaporation, seepage, plant uptake etc. The irrimate® software focuses on the monitoring of water storages, and collects data using a weather station and data logger, as seen in the image on the right. Whilst with Aquatech, I was able to go onsite and install a weather station and water storage depth monitor that will be used by the Irrimate software. The software also provides live accurate data on the size of the storage, and how much is being lost on a regular basis. The weather station is also connected to the 3G network, meaning the farmer can check the status of their water storages from anywhere in the world.

The Water-Track™ software on the other hand monitors how the water is being used, and is able to account for every megalitre brought onto the farm and is able to show if it is being used in crop growth, seepage and evaporation, deep drainage, transpiration etc. It is also able to distinguish between losses in water storages, channels and tailwater. I found this software quite revolutionary, as there is really currently no other ways to monitor water use in the same level that Water-Track does.

The final day was spent at CSD (Cotton Seed Distributors) where I was lucky enough to attend a company field day and view one of the crops where they are developing the next generation of Bollgard III®. It was a great opportunity to see the developing crop, which will be used to successively sow the next generations to soon have the seed available in commercial quantities. The reasoning for the development of the new seed was to reduce the risks of pest immunity to the pesticide genes developed within the cotton seed. Bollgard III is home to 3 proteins which aid in the management of *Helicoverpa* species, as opposed to Bollgard II® which only has 2 proteins designed to control the insects. Currently, three in every 1000 bugs have developed an immunity to one of the proteins in Bollgard II®, and so further insect immunity has been pre-empted with the introduction of a third protein in Bollgard III®.

In conclusion, the industry placement was a great experience and I personally gained a lot from it. Not only did I gain an insight into how the cotton industry works and operates, but I also made some strong contacts with industry professionals, which I am greatly happy about. After the internship, I realised how much career potential there is within the industry, and as an aspiring Agricultural Engineer, this excites me a great deal. I am looking forward to becoming more involved within the industry and, whether it is through further experience or through my 4th year engineering thesis.

Acknowledgements

I would also like to thank the whole team who made the internship as enjoyable and rewarding as it was. I know it may have been the first time that an Agricultural Engineer was accommodated for, however everyone did a great job to put me in contact with the right people, given my engineering background. I would like to thank Sandy Young and her hospitality for making me feel welcome in Narrabri. I would also like to thank Trudy Staines for organizing my placements through the week with Namoi Cotton, Aquatech Consulting and CSD. Further from that, my placement contacts were extremely informative and provided me with the insight to the industry which I was chasing; John Fox (Namoi Cotton), Jim Purcell (Aquatech Consulting) and Bruce Cowan from CSD. I also mentioned to a few of the guys that I would love to head back down during harvest/ginning season just to see everything in action. I hope to do this around Easter time.

Ned Skehan

School: **University of Southern Queensland**

Industry Placement: **Auscott, Narrabri**

> ***"Before I started the week my interests were with irrigation development. However, after seeing the greenstar in action in the pickers and tractors, the technology involved all the way along the production line and the potential for improved technology, my interests have really shifted towards precision agriculture."***

Cotton Industry Placement

I was recently given the opportunity of a five day internship through PICSE within the cotton industry during May 2014. I spent the whole week with the people at Auscott's Namoi Valley operation, North West of Narrabri. This was a fantastic experience that gave me the much needed insight into the post study potential of my chosen degree, Agricultural Engineering.

Auscott is a company that grows and sells cotton so it was great to be able to see the entire process, from preparing the fields to picking, to ginning. I was there during the end of the picking season so I saw the pickers working first hand, as well as field preparation for the next season's wheat crop. This was a real eye opener that exposed me to aspects of farming I'd never before even considered, and coming from a farming background myself, I'd consider this to be quite significant.

When I arrived on the first day, I had a meeting with the Farm Manager where he laid out a plan for the week. Monday was spent with the pickers where I drove for a little while and learnt a lot about the workings of the new round bale cotton pickers. Auscott has designed a trailer to tow behind the picker so the bales are brought to the tail ditch for trucking, rather than dumping them throughout the field and having to pick them up with a tractor. As this is in a way an 'invention' by them, it really amazed me as I was quite naïve to the independence and knowledge the company has. The 7760 pickers really are an amazing machine; they are so enormously big and powerful, yet extremely accurate and technical. The software within them is very highly sophisticated, yet it can stand up to the rough dusty conditions and still perform flawlessly.

With all this technology also comes a price tag and I was amazed by the emphasis the picking team puts on making sure the pickers are picking every minute possible, even when turning around at the end of the row. I was told that after all costs taken out, each picker is worth $22/minute to the company, so pulling up for 5 minutes for the driver to 'stretch their legs', will cost Auscott over $100.

I was also taught about how the picking was going from an agronomic stand point as opposed to the mechanical side. It was very intriguing as I had very little understanding or appreciation for the biology of producing and picking a crop. After hearing from the agronomist I'd almost be inclined to study some agronomy type courses.

The second day I spent with the agronomist who also looked after the GPS guidance in the tractors. It was extremely insightful to hear about the full cotton growing process and made me appreciate the complexity of the entire farming operation. Every square inch of the farm has a role to play and the whole lot works together to make production as efficient as possible. I was shown how the irrigation works and discovered they can move water 37km with only two lift pumps, and it was designed around 50 years ago when the technology was obviously not as advanced as it is currently, so it amazed me that the actual idea of water movement has not changed with time and technology as everything else on the farm has. As the water is moved from the reservoirs to the irrigating channels, the agronomists add urea (fertiliser) to it at a controlled rate so that when they irrigate, they are also fertilising, and in the process, removing the costs associated with fertilising from a tractor. These types of efficiencies are the key to being a successful enterprise and Auscott are doing a great job at that.

On the second day I also spent some time on a few different tractors learning the different processes each was doing. I learned that there are quite a number of processes involved to prepare a picked cotton field for a wheat crop, at least four in fact. This obviously costs a lot in labour, machine wear, and diesel, so in recent years two of the processes have been combined into a single pass. I can see this, implement design, as a viable career path for an agricultural engineer as there is always a calling for improved technology and equipment. One of the machines I was on was a wheat planter. My family grows a few small oat and wheat crops at home so this was possibly the only piece I could really relate to on the whole farm and even this was more technologically advanced than what I expected. It has sensors all over it telling the operator how much seed is being delivered, any blockages in the air lines, and the most intriguing part was all changes can be made from the cab. This part of my week was the

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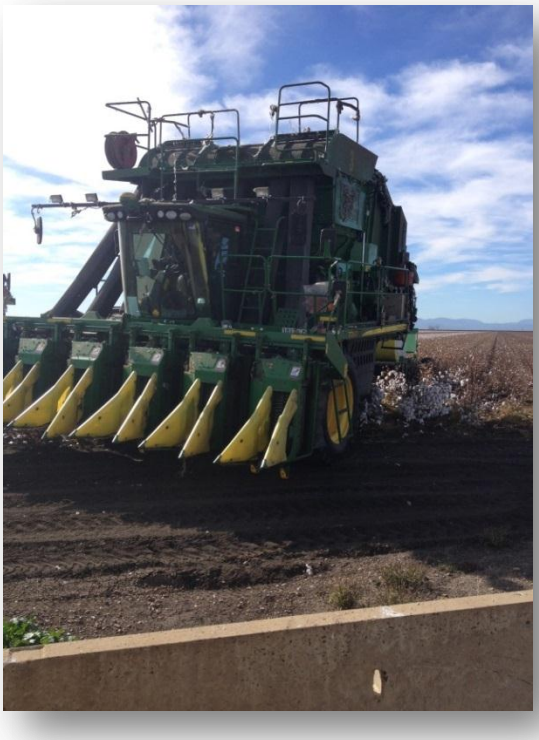
most appealing to me. This and the GPS guidance really took my interest.

The third and fourth days were spent looking through the gin and a bit more work with the pickers. The gin really amazed me with its complexity and abilities and seeing it in its working state was spectacular. I couldn't believe how quickly it would process a module of cotton. While I was in there an alarm went off for a potential fire in one of the stands, the stand immediately shut down and isolated where it thought the fire was and the bales that came through were put aside in case one was smouldering. It was interesting to see how quickly and safely the problem was solved, with the stand starting back up in minimal time. The manager showed me a little about grading cotton based on colour and trash content and explained how technology was involved with the whole system. I was amazed to learn that a sample is pulled off every bale and when a buyer is looking at the sample 'in the shop' in Sydney for instance, he can know from where the bale was picked with GPS coordinates to a few square metres and buy specific bales that came from nearby this location. This is all done through the pickers' technology, working with the gins' technology to allow extreme precision all along the production line. The information from technology like this can be used by the managers to make more informed decisions and increase production.

On the last day I went into town and met with Andrew Smart from Precision Cropping Technologies and Anthony Fairfull from Aquatech Consulting. Anthony explained the technical side of building dams and complete irrigation set ups, while Andrew explained a little about where technology in agriculture is moving towards. Before I started the week my interests were with irrigation development as this was really all I imagined an agricultural engineer could do. However, after seeing the greenstar in action in the pickers and tractors, the technology involved all the way along the production line and the potential for improved technology, my interests have really shifted towards precision agriculture. Speaking to Andrew about his work with data mapping and his involvement with John Deere really motivated me towards this career path.



Finally, the industry placement was really an eye opener and a huge motivation boost for me to achieve well at university and do more work placements. One thing Andrew mentioned to me was as an employer, he's not overly concerned whether you've come out of university with the highest achievement possible; he told me that doing actual work experience and networking with industry professionals is the best thing that would prepare me for a career after university. The week allowed me to gain invaluable insight into the real world applications for my skills as an agricultural engineer and gave me a solid direction to pursue throughout the rest of my studies. I'll

now make better choices for myself when it comes to picking electives in my final year, and keep pursuing possible work experience opportunities as time permits.

Acknowledgements

I'd like to thank the whole PICSE team for making this week possible, it is an excellent opportunity for any agriculturally orientated student and the PICSE team does a very good job ensuring it happens without any trouble. I'd especially like to thank Kay Lembo and Trudy Staines for their organisation and Sandy Young for her hospitality. Thanks also to the Auscott team, namely Martin Mead and Will Porter who did a great job showing me the ins and outs of cotton farming. I have made many great contacts as a result of this experience and look forward to my career in agriculture.

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Talgarth Partnership

USQ – Centre for Systems Biology

USQ - Faculty Health, Engineering and Sciences

USQ - National Centre Engineering in Agriculture

VHR - Armidale

Withcott Seedlings

Zoe Bowerman

School: **Assumption College, Warwick**

Industry Placement: **Department of Transport and Main Roads, QLD**

> ***"Environmental management was an area that I had looked at before wanting to become a veterinarian, although I never fully understood what their job required."***

Industry Placement Camp

During the week of the PISCE camp, various areas of scientific occupations were viewed to allow for a vast experience and to gain the knowledge of other occupations available. With the majority of us coming from an agricultural background, the thoughts of what we would do for our work experience after the week, was broadened. Myself, I originally wanted to become a veterinarian. However, after the week of various occupations being on display and given the knowledge as to the background of the jobs, my mind quickly changed.

The camp was an amazing experience that I would recommend to other students who want to enter a scientific field. Majority of the areas visited were broad and had many jobs available within the teams they worked in, although my favourite parts of the week had to be; the liquid nitrogen ice cream, the wine chemistry and the Queensland Murray-Darling Committee. The number one favourite however, was the QMDC, purely because it interested me with all the work they do to sustain and manage catchments and wild pests that are contributing to the hassles of sediments and erosion.

My Industry Placement

From my change of wanting to be a veterinarian, I decided to look at parts of the week that really interested me. That therefore being the sustainability and management plans of waterways and in a vast outlook, the environment. Environmental management was an area that I had looked at before wanting to become a veterinarian, although I never fully understood what their job required.

The week of work experience was directed by Ken McCray, an Environmental Officer at Main Roads; Warwick. Also helping me through out the week was Michael Yates and Matthew Heads. With these people I was able to look at the aspects of being an Environmental Officer, both behind a desk and out in the field. Within the week I was given multiple chances to explore the day to day jobs that they would do to assist RoadTek; a major provider of transport infrastructure solutions throughout Queensland, also a neighbouring governmental business.

Other jobs that they would contribute to is maintaining road reserves; but protecting native flora and fauna (if present) and to govern a record of declared weeds in which they would use in the future to assess if money should be spent to spray; also protecting significant environmental areas, which are environmentally sensitive areas.

Another aspect of their job is to assess contracts and to see if the contractor is being legitimate about their contribution to protecting the environment; in what way they can during the construction; and to see whether or not they fully understand the laws that they are governed by.

During this week I was also broadened to cultural heritage and its importance. When exploring an area of land that is soon to become a road, it was incredible to discover how much work first goes into the planning, for example the first time the site has to be examined.

Through the examination of the land, flora and fauna species have to be collected along with their status. A status is given to animals and plants based on their numbers. They can be common, vulnerable, rare or endangered. These statuses are in place to help with the significance of the plant or animal species.

Also during the examination, cultural heritage and artefacts are of a high priority. Scar trees along with tools in which aborigines would have used were found along this particular site.

The enthusiasm that the Environmental Officers have is driven by the passion for their job to protect these trees that have been around more centuries astounded me. Although it touched my heart that this type of heritage is protected, as it's a constant reminder of who we are and what we have come from.

How My Placement Influenced Me

One comment made to me during this wonderful and eye opening experience was that "once you have seen this side, you can't un-see it." This comment I truly believe. Since the week of work experience my mind has been broadened and I don't want to stop that. I believe that the world of environmental science is a forever exciting and beautiful world, every tree has a story, just like the aboriginal scar trees and every animal is unique as to how it survives. Also not to destroy your unwanted thistles as they may just be protected native plants. Once something is gone you can't get it back, so this line of work maintaining that balance is a truly inspirational job as it protects our future and allows future generations to be able to see what we see now.

Acknowledgements

I would like to thank Carissa Anderson for this wonderful opportunity that has opened my eyes to the many career paths which are out there. You have really help me to decide my future pathway. I would also like to thank Ken McCray, Michael Yates and Matthew Heads for being outstanding mentors for my week of work placement; I truly believe this is where I want to end up.

STUDENT REPORTS

Nathan Cheetham

School: **Pittsworth State High School**

Industry Placement: **DAFF - Maroochy Research Station**

"My time at the Maroochy Research Facility was valuable and time well spent."

Industry Placement Camp

Back in November 2014, my science teacher came to me and asked if I'd be interested in applying for a PICSE scholarship. Knowing that the PICSE scholarship was an amazing opportunity, I filled out the required form and sent off a digital copy to be assessed. When I was notified that I'd been accepted into the program, a nervous sort of anticipation claimed me. Despite the anxiety I felt in the lead up to the beginning of the camp – and later on, the industry placement, - I wouldn't change this experience for the world.

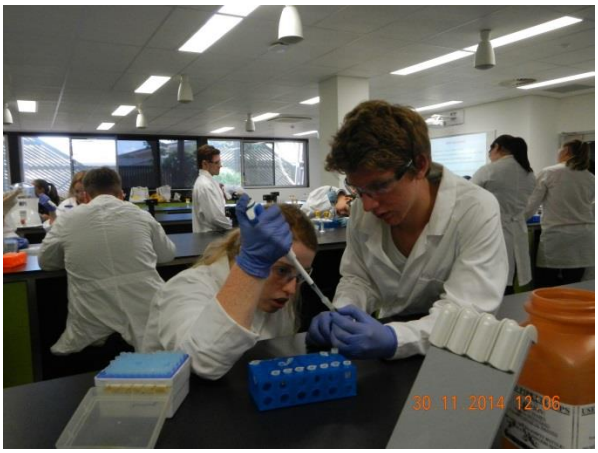
In early December, I, along with 30 other PICSE students began the exciting first step of the scholarship; the all-expenses-paid weeklong camp at the University of Southern Queensland Toowoomba. As soon as we arrived, Trudy, Carissa or Ingrid swooped in to guide us into the dining hall and through to sign in, sparing us from those few awkward minutes of staring at each other and hoping that someone would say something. Day one consisted of utilising USQ's wonderful science facilities. We began our time in the labs with a quick rundown of safety procedures before we moved into discussion of how the staff made it to where they have in the scientific community. After a quick break, we were straight back in the lab with the hope of extracting DNA from simple plant matter. With centrifuge tubes full of green gloop and DNA that looked like spider webs, the thrill of success filled the room.

After lunch we completed a one-two combo of liquid-nitrogen ice-cream and a riveting discussion about the merits and composition of soil at the university and the National Centre for Engineering and Agriculture (NCEA) respectively. At NCEA we also were told that soil is always soil; never dirt.

Day two called for an early rise as we were headed to Brisbane via Queensland Murray Darling Committee (QMDC). At QMDC we were shown all the perks of the job at the Queensland Murray Darling Committee before we headed outside to learn about groundcover. After this activity we were off to the Food Science Precinct at Coopers Plains. Here, we were run through food technologies, clinical biochemistry, pesticides and biosecurity. After an interesting day, we piled back onto the bus to get back to Steele Rudd College in order to complete the promised night activity with Robogals. That night, we all fulfilled our dreams of building a robot to complete our bidding and to fulfil our every whim, all thanks to Robogals.

Wednesday was another 'up-with-the-sunrise' day; we were off to Stanthorpe. After two and a half hours sitting on a coach, we found ourselves at The Bramble Patch – a quaint little restaurant and independent preserve seller. After a delicious morning tea of berry-based desserts, we made our way to the Queensland College of Wine Tourism. Here, we were introduced to vineyard formation and put to work removing excess vine which consumed important energy. Then we learnt the subtleties of the art of winemaking. From white to red to pink, sparkling, sweet, dry, dessert or dinner, we learnt that day how to create them. From there we moved into a classroom where a mock wine-tasting turned into a lesson in the human sensory system, both aspects of this time were very interesting. We headed back to Toowoomba to prepare for our night out at Milne Bay.

Thursday was still a very busy day of industry visitations around Toowoomba. First off we visited the Leslie Research Centre where, once again, the importance of soil microbiology and entomology was imparted on us.



After the Leslie Research Centre, we made our way to Monsanto where we played with moths at various stages of their life cycle. After squishing a few caterpillars and dropping some pupa, we paid a visit to Vanderfield Toowoomba where we received a tour of their impressive facilities and to witness their advanced hands-free steering for ourselves.

The National Centre for Engineering and Agriculture was next in line on our busy schedule so off we went, eager to see what three young engineers had come up with. What awaited us was a mixture of weed-killing, crop-checking and invasive-species-eradication with a bit of augmented reality thrown in for good measure.

Due to heavy rain, Friday's original plans of visiting a cotton farm near Brookstead were cancelled. Instead, the cotton farmers came to us. We spent the day inside one of the USQ labs learning about the layout of cotton farms and getting to see various crop seeds that are planted around the region.

The camp was a wonderful experience which really helped me to see what a diverse choice of careers there are in science.

My Industry Placement

For my PICSE Industry Placement, I was fortunate enough to be placed at the Maroochy Research Facility (MRF). Here, the plan was that each day, I'd work with a different industry professional to get a general idea of how things work at a Department of Agriculture Fisheries and Forestry facility such as MRF. I spent all of Monday with David Brunn, who is the resident expert in persimmons and custard apples. Monday mostly consisted of physical labour; netting orchards, shifting saplings so they could sun harden, watering experiments.

Along the way, I did learn that custard apples come in more than just green, but also purple, pink and red. Monday was a good start to the week and I was looking forward to more.

Day two was spent with John Leonardi. John works mostly with pineapples and weeds. To begin with we collected and planted seeds from a weed in order to experiment on them. Then we proceeded to plant 64 pineapples in a combination of compost, sand and peat – the perfect mix for optimal moisture retainment. These pineapples were being grown in order to culture mealy bugs.

I spent Tuesday afternoon with Apollo Gomez in a horticulture lab cutting small pieces of strawberry leaves in order to find what pathogen/s were affecting the plant. The remaining time was spent observing fungal spores cultured on previously prepared agar plates.

Wednesday morning was spent with Lindsay, who works with Apollo, cleaning out experimental strawberry plants so that they would reach perfect health before they were infected with a pathogen to see which variety of strawberry reacts best and worst to certain infections. Wednesday afternoon was spent with John Leonardi measuring pineapples to find the differences between a control patch, plastic mulch and biodegradable plastic mulch.

Thursday was a wet day, it never really seemed to stop raining while I was there. I spent the day with Eddie Howell. Eddie is the technical officer of stone fruit and macadamia. We spent the day planting out peach seeds in seed trays, comparing cinctured and non-cinctured macadamia trees and monitoring stone fruit trees in the shade houses.

Friday was a field day. I spent the morning in Biosecurity with Stacey Harris. We headed out to Gympie to check surveillance cameras for images of wild dogs. We retrieved the SD cards from the cameras and headed back to Maroochy to view the photos the motion-activated cameras had captured. From monitoring the pictures, we gathered that a small group of wild dogs would move through the area at approximately the same time each night.

We also found photos of a large wild pig. From the evidence gathered, the team at biosecurity would put out baited meat through the property. Friday afternoon was spent in the tissue culture labs performing the fiddly procedure of sub-culturing and the even fiddlier procedure of initiation.

How My Placement Influenced Me

My time at the Maroochy Research Facility was valuable and time well spent. It served to show me what sort of work there is in horticulture and biosecurity areas.

The PICSE scholarship is a brilliant program and is a great way of helping students who wish to pursue science realise what areas of science are for them.

Acknowledgements

I'd just like to thank Carissa, Trudy and Ingrid for running the PICSE camp that started us off on our journey. I'd also like the thank Garth and Peter for supervising me while I completed my placement. A huge thank you must also go to Dave, John, Apollo, Lindsey, Eddie, Grant, Stacey, Katie and Sharon from the Maroochy Research Facility. The PICSE scholarship has been an invaluable tool to assist in deciding my future path and has provided me with something I'll take away and use for the rest of my life.

Sophie Cooper

School: **Calrossy Anglican School**

Industry Placement: **USQ - Faculty Health, Engineering & Sciences**

> ***"Animals and nutrition fascinate me and I wish to pursue my career into animal nutrition mainly in cattle and horses."***

Industry Placement Camp

The PICSE Industry Placement Camp was first introduced to me by my teachers at school and by Carissa our PICSE Cotton Co-ordinator coming to talk to us about what was involved in the camp. I've always had an interest in primary industries, science and agriculture and this camp was great as it broadened my knowledge and helped me get a better understanding of the careers available in the primary industry field.

I highly recommend this camp to anyone who is interested in science or agriculture or even if you aren't it is a great opportunity to meet new people and to create networks with people that are already involved in the type of field that you are interested in. I believe that this camp has helped me decide what kind of career I would be most suited to.

The trip up to Steele Rudd College at the University of Southern Queensland (USQ), Toowoomba was very long but worth it in the end as the week that lay ahead was full of interesting and new concepts that I learnt along the way. On the first day we met all the students in our group and had a small taste of university life living on one of the college campuses at USQ and doing hands on activities in the labs including DNA extraction, making liquid nitrogen ice-cream and looking at soil in a different perspective therefore opening our eyes to how interesting and important "dirt" really is.

Travelling to Brisbane to visit the Forensic and Scientific Research Centre for Queensland, Stanthorpe to learn about the Queensland College of Wine Tourism and the process of turning grapes into wine.

On Thursday we went on Industry visits around Toowoomba one of the highlights for me on this day being Monsanto. Throughout the brand new Monsanto Laboratories I learnt so much about the importance of protecting cotton and a range of crops from pests and diseases in order to make the agricultural industry stronger and how much work actually goes into creating this outcome.

Friday, the last day of our camp was one of my favourites as a farmer and an agronomist came to USQ to talk about the process of growing Cotton. Being off a livestock property and not knowing a lot about growing a crop, the amount of detail and information that I learnt about cotton and how much work many different people put into it was extremely eye opening and not something that I expected.

My Industry Placement

My five day PICSE Industry Placement I attended was at the Department of Biological and Physical Sciences at the University of Southern Queensland (USQ), Toowoomba. USQ aims to provide a confirmation basis for dietary choices to improve the health of people in the wider community. On the first day Petro and I arrived and we were given a tour of the animal house where all the rats involved in the experiment for metabolic syndrome were kept. Every morning the PHD Students, whom we got to know very well would weigh the rats, their food and water to see how much weight they had put on and the amount of food and water they had consumed. Every morning Petro and I assisted with this process it took quite a while as there were many rats to get through.

Meanwhile in the next room of the animal house we watched Nikhil check the blood pressure, pulse and heart rate of his rats and were amazed at the tiny cuffs placed on the rat's tail in order to take in the measurements.

Anaesthetic was given to these rats in order to make the process easier and a saline given under the skin to keep their body at normal temperature. Every eight weeks the PHD Students take the blood pressure, heart rate and pulse of the rats which takes up most of the day. Half of the rats are given a high fat high carbohydrate diet consisting of beef tallow, condensed milk, powdered food, fructose, salt mixture, water and a percentage of sugars in their drinking water. Rats fed on the high fat diet are used to test different nutraceutical preparations such as olive leaf extract, purple carrots, chia seeds, piperine from black peppers, coffee and caffeine, omega-3 polyunsaturated fatty acids and ferulic acid from cereals. The other half were given a low fat diet of corn starch, powdered food, salt mixture and water in order to mimic the different diets in humans to compare the different outcomes. Being involved in the interesting part of the scientific research that the PHD students were working on was great but we were also given a taste of the not so interesting jobs that needed to be done such as doing a stock take of all the equipment in the lab and sorting through hundreds of Material Safety Data Sheets that had to be downloaded and placed in Alphabetical Order. On the last day Nikhil was doing an Oral Glucose Tolerance Test on all of his rats using a glucometer. A blood sample is taken out of their tails and the measurement is recorded in a book every eights weeks every half an hour for five times day per rat. It was very interesting to see the decrease in their glucose levels each half an hour and the difference between the rats on the high fat diet and the corn starch diet. The PHD students keep their rats for around 16 weeks in which time they then give them a lethal injection to terminate their lives. The week after we did our placement was going to be one of the most interesting as Nikhil's rats were old enough to be given the deathly injection and dissected in order to investigate the internal differences between the rats fed on the high fat diet and the corn starch.

How My Placement Influenced Me

My week of industry placement influenced me in the way that I was exposed to the many different types of careers in the Science field and the different ways in which many people and animals can contribute to a healthier society. Being involved in the nutrition research project at USQ didn't change my mind about what I wanted to do with my career but opened my eyes to the different university options and study choices that were available I have come to the conclusion that animals and nutrition fascinate me and I wish to pursue my career into animal nutrition mainly in cattle and horses.

Acknowledgements

I'd like to thank everyone who organised my industry placement and the camp especially Carissa Anderson and all the PHD Students at USQ who enlightened me to the different career options that can be taken in science and informed us about what their careers involved.

STUDENT REPORTS

Emily-Jo Copeland

School: **Calrossy Anglican School**

Industry Placement: **Australian Cotton Research Institute**

"I have realised there are many career paths I can take and just how many scholarships are out there for students like me"

Industry Placement Camp

The industry placement camp was definitely a step in the right direction for me in regards to figuring out what I want to do with myself when I leave school. The camp introduced me to many science and agriculture based careers that I had never thought of and may want to be part of. The camp has given me an idea of what university courses I may want to take and definitely an idea of the ones I don't want to take.

This camp gave me the opportunity to meet and make friends with many other students that are crazy about science and agriculture. After the first night everyone seemed to be fairly comfortable around each other. The activities we did introducing ourselves and having to find a partner and tell everyone something about them was a very good building block for a friendly atmosphere. I feel that if none of us interacted with each other that everyone would feel uncomfortable and not want to ask questions or participate and offer up ideas in a discussion.

I liked how we participated in lots of hands on activities like Wine tasting, soil testing, making ice cream, removing root systems from plants. It was very interesting listening to how the speakers got to where they are. Through this camp I have realised there are many paths I can take and just how many scholarships are out there for students like me.

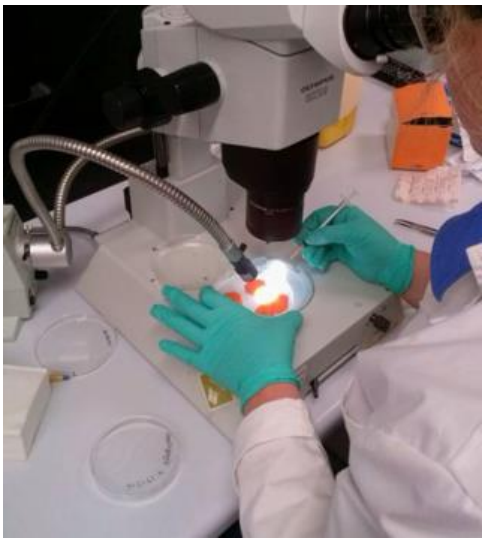
My Industry Placement

My work placement was at the Cotton Research Centre in Narrabri where I moved about the centre to the different departments each day. On my first day I was placed in the breeding shed and I went out bug checking, we only recorded destructive insects.

I went back to the breeding shed and recorded data from a seed trial; we had to record the percentage of seeds that germinated. After we drove out to a trial plot and thinned out a row of cotton and numbered them and then identified them by their leaf shape/size. Then went and walked through gin at the research centre and although it wasn't running at the time I was showed how it all works and how the cotton is cleaned and the seed is removed. I then went over to the soil department and worked with a man called Louis. First we weighed samples of soil that had been heated so they were firm enough to tie up and hang from a hook. Then we dunked them into wax and weighed them again. We dunked them into wax to prevent the soil from crumbling when we weighed them in water. Louis also showed me how to record the pH and EC (electrical conductivity) of liquids.

Day two should have seen me driving to Coonamble or Walgett to look at cotton out there. Although not everything always goes to plan, so, my day started off chipping weeds for about 2 hours. Then I was sent over with a university student so I didn't have to spend the rest of the day chipping, we started off recording the chlorophyll content of a trial plot of cotton using a device called a SPAD. Then we attempted to use a sun scan to measure how much sunlight was coming down from the sun above the plant, then measure underneath the plant in the shady area to calculate how much sunlight the plant was taking in. Although the cloud cover made it impossible to get a clear reading.

Day three I was situated in a pathology lab looking at black root rot. My day was planned that we would set up and experiment. But first I had to measure the growth of some samples of root rot from neighbouring farms, to do this you had to measure the diameter of the sample in five times and get the average. The experiment we started was placing one single spur of root rot onto a piece of carrot, tricky? Yes! First we cleaned off our arms, hands, benches and knives to kill any germs and to reduce contamination. I then stared peeling carrots and cutting them into round pieces. We then had to cut a section out of the middle of the carrot and also cut into small circles.



Then I washed the carrots in a cleaning solution and placed five big pieces of carrot in each dish and labelled it. Then I sat down in front of the microscope with a needle and extracted one spur and placed it on each carrot, then placed a small piece of carrot on top of the spur. This is so the spur had ideal living conditions.

Day four I went out to an insectary that focused on the heliothis moth. First I was shown how to make the diet that the larva eat and then i squirted the diet into trays with 20-30 little compartments. Then I was propped up at a desk with about 6 bags of larva each with different parents. Because the larva are so fragile and easy to squish I had to pick them up with a paint brush and place one in each little compartment. Then I had to iron on a thin piece of plastic so they couldn't escape, and had to poke tiny little holes into the plastic to allow the larva to breath.

I then went out the back of the insectary and watched how to apply insecticides to the larva that were at the 3-4th instar so they were quite a bit bigger than the ones I was putting into the trays. All that happens is you apply one drop to the larva's back. There was still time before I caught the bus back into Narrabri so I was given a brown paper bag full of cotton leaves/stems that had heliothis eggs on them.

I just had to use a paint brush to remove the egg and place it into a tray, then iron on a plastic sheet and poke holes. I also did this for bags of cow pea.

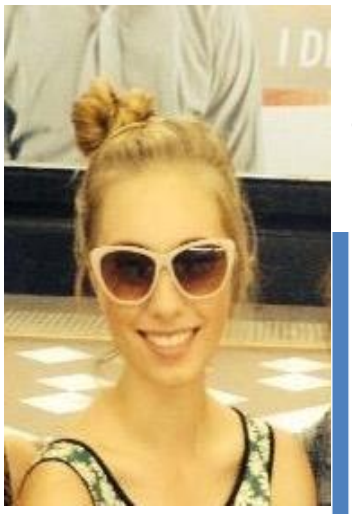
On the last day I was sent over to another insectary next door although this insectary focused on mirids. My day started off by feeding the mirids. First I pulled out all the tubs with the old beans and old water and I cut up just ordinary beans and put them onto a tray with a fresh tub of water. I had to pay extra attention while pulling out the old tubs and putting in fresh ones as the mirids inside the netting had to stay inside the netting! So I had to brush off the mirids before pulling out the old tubs. After finishing feeding them we had to go and spray some cotton plants that were in a trial in a green house. We had to spray an oil based deterrent to try and deter white fly from laying eggs on the cotton. We were only in the green house for about 15 minutes because it was 47 degrees in there.

How My Placement Influenced Me

In doing both the camp and placement I have realised there are many career paths I can take and just how many scholarships are out there for students like me. There are a wide variety of opportunities within the cotton industry and I am keen to explore this further as I get older and more established within my career.

Acknowledgements

I would like to thank Carissa Anderson and Trudy Staines for your organisation for both the camp and placement. Without your help I wouldn't have gained the knowledge and experience. Thank you to all the people out at the Australian Cotton Research Institute (ACRI) in Narrabri for showing me what you do out there and for allowing me to help and ask as many 'silly' questions as possible and for showing me what the cotton industry has to offer once school is over.



Stella Echentille

School: **Lockyer District High School**

Industry Placement: **BlackBoy Ridge**

"Farm like you will live forever. This is a proverb I saw once on my schools agriculture classroom's whiteboard. At first I understood the basic structure of this saying however after working on a farm for one singular week, I realised how little I comprehended this truthful figure of speech."

Industry Placement Camp

Apprehension, fear, excitement and elation. These were the emotions I was experiencing as I took the, rather quick, journey up to the Toowoomba USQ campus for the PICSE Cotton Scholarship Camp. I had the mind-numbing feeling of fear that I wouldn't fit in. I had apprehension for the whole experience in which I had no idea what to expect. Excitement was pulsing through my veins because, you know, 'anything could happen' and, finally, elation for the fact that I've been given this opportunity in the first place.

As I was mentally convulsing with these conflicting emotions, I was already there, carrying my suitcases into the College mess hall. I looked around to see who was there and all I saw was saw smiling, happy faces greeting me and a lage pool table calling my name and as these thing caught my sight, all the emotions I was feeling fell away because I knew that this week was going to be amazing. The week was nothing I could have ever prepared for. No amount of training or preparation could have equipped me for the PICSE camp. This perfection was off the charts. Each industry we were introduced to, whether it was agronomy, soil science or even wineries, I learnt something new, something amazing, and something that took me one step further to my decision of my future career. As we jumped from animals, to soil, to plants, I had a sort of mind-blowing epiphany that this is what I wanted to do with my life.

For the reason that people underestimate how catastrophically important primary industries really are. All the little jobs that no one thinks of and that no one cares about are the jobs that contribute to the food we eat and the environment we live in. I got to learn so many fascinating things from each industry we went to and I got to experience things I never though I would have the privilege to experience.

From DNA extraction, which made me feel like a hard-core scientist, to fake wine tasting, which was, to be honest my favourite place we went and to ice-cream making, we certainly got to experience the best of the industries. We experienced soil testing, bug holding, wine tasting, scientific ice-cream eating and the most fascinating of them all, GPS mower technology. However, it wasn't all learning and handwork, we also got to have a bit of fun. There was the infamous pool night, the bowling evening, the horribly frustrating robot construction and, of course, the most amazing berry pancakes ever created in which we got to ingest, courtesy of PICSE. Through all the great days and evening, I would have never been as good without the friends that I was on the camp with. I made many amazing, funny, crazy and eccentric friends on this camp. Friends which I could stay friends with forever. Their presences really added to the whole experience.

As the week came to an end, I said my last goodbyes/hugs and left the camp with more knowledge and experience than I ever could have imagined. My mind was racing with new ideas for the future and I believe I have PICSE to thank for my revelations. However, it wasn't over yet. Industry Placement was creeping up quickly in the New Year which leads me to my next story; 'Working on a Farm for a Week'.

My Industry Placement

Farming… something thought to be hard, unforgiving and ruthless. These ideas of farming are completely right. I honestly thought I was falling apart by the end of the week. My nails were all broken, my skin was a red as tomato, my hair greasy and soaked by sweat, my legs and arms were burnt and bruising and blistered and, yet, my heart was filled with pure satisfaction and pride. I had one of the most beneficial and fun weeks ever. I mean, sure it was difficult but I liked the hard work because I was not only benefiting myself and my inner strength but I was contributing to the wider community in a way which the community wouldn't even know.

Blackboy Ridge is a local Gatton farm about 15 minutes away from my house consisting of 100 acres of nectarine, peach and fig trees.

This beautiful, scenic farming area is vast in space but small in employees. I worked with seven amazing farmers that do this job every day, every week.

This small, close-knit group opened themselves up and introduced me to the tricks of the horticultural farming trade and gave me a wider knowledge in fruit production. I have to say fruit is a tricky thing to farm. It consists of many small but vital jobs that contribute to the end product drastically, whether it be the simple art of weeding acres and acres of rows of baby nectarine trees or taking the fruit off growing fig trees in order for them to grow more efficiently.

Each little job takes a large amount of effort in which I was happy to give because I loved doing it. However there was one menacing, evil fruit in which became my arch nemesis for the rest of the week. We fought a mean fight but in the end we became friends. This, my readers, was the diabolical Fig.

The infamous Fig tree is a wild, ruthless organism that can burn you with the slightest touch of its enzyme filled sap, causing dark red welt on your skin that don't go away. It leaves itch like sand paper and after packing over 200 boxes of them over the 5 days, they can become evil in a sort of mocking way.

After plucking their leaves, de-fruiting their branches, and packing their little plump bodies into a large cardboard box, I can honestly say I still don't mind those little organisms.

However mean and harsh they are, I loved doing it. The hard work did me good. It made me appreciate all the farmers in Australia, in Queensland and in my community. They work so hard to provide the public fresh, good food. Their blood, sweat and tears are what gets us the food on the table, the fruit in our hands and the meat on our plates.

How My Placement Influenced Me

So, there you have it. The inner thoughts about my industry placement. I have to say, I'm surprised as to how much I enjoyed it. I mean, I don't want to be a farmer for the rest of my life but I have to say I really loved working there. The hard work was satisfying and it brought purpose into each day, knowing that I helped out. The people I worked with were absolutely amazing and extremely helpful, never treating me like a brainless nuisance and letting me do actual, beneficial work. Even though this may seem cliché and cheesy but I do believe I'm a better person after this and I have the scars to prove it.

Acknowledgements

I'd love to thank (and praise) the PICSE program. My thanks go out to my PICSE coordinators Carissa Anderson, Ingrid Gow and Trudy Staines. These women have work their butts off to make this camp and industry placement as beneficial and enjoyable for us as possible and they certainly have succeeded. They have certainly changed the lives of 30 teenagers this year.

I would also like to thank the University of Southern Queensland and all those who prepared presentations and tours for the PICSE students to attend during our week on the camp. I am truly grateful for all the effort you all went to. Lastly I would love to thank all the people at Blackboy ridge Farms for giving me the opportunity to learn. I'd especially like to thank Rose, who was my mentor for the week. She was understanding, when I didn't understand, helpful when I needed help and always making me feel wanted and needed.

STUDENT REPORTS

Petro Ferreira

School: **Pittsworth State High School**

Industry Placement: **USQ - Faculty Health, Engineering & Sciences**

"My industry placement was a learning curve which opened eyes to what working as a researcher is all about"

Industry Placement Camp

The Industry placement camp held prior to the participant's placement offered each the chance to get a taste of a wide array of jobs within the primary industries. It gave all of us the opportunity to meet professionals and learn about their work and interests. We listened to many talks from scientist, engineers, farmers and even experts in the field of robotics.

The experience acquired throughout the week adequately helped to fine tune the preferences for our industry placement- ensuring we understood what we were up for.

Fun moments definitely were not absent throughout the week. I had the opportunity to share this experience with likeminded students whom not only share my thirst for knowledge but my interests in science related studies. Getting to know such wonderful people was definitely one of the highlights of the week. The fun was extended with activities including trips to the pool, robotics, lunch at bumble patch and lesson in wine tasting (with apple juice).The industry placement camp opened our eyes to the reality that science is definitely not a boring field.

Throughout the week, we took part in a large array of activities aimed at broadening our minds, so that we might understand the importance that science has in providing a sustainable future. In particular this camp had a focus on the sustainability of crops -in relation to disease control, irrigation, pest control and machinery. It demonstrates that the knowledge and expertise of a variety of different scientists are required to keep this world moving forward. This was the most vital lesson which I learnt in my time at camp.

My Industry Placement

My week long industry placement was with a group of PhD students at the University of Southern Queensland working with nutrition - particularly in reducing the symptoms of metabolic syndrome and obesity with a variety of different dietary treatments ranging from chia seeds to coffee beans. These experiments are conducted on rats where for an 8 week period they are fattened up with a high-carbohydrate, high-fat diet; the control rats are kept on a corn starch diet. It is at this point that the rats are put under light anaesthetics so that their pulses and blood pressure can be safely tested- which I had the chance to observe. Though out this procedure the care with which these rats handle was truly amazing.

After the initial fattening period the rats undergo a 16 week treatment phase in which a specific food is supplemented into their diet.

Once this stage is complete, the rats are then euthanized by lethal injection and dissected for the purpose of studying the effects a particular treatment had on a rat. This is done using a variety of impressive equipment however the most remarkable is the langhoff kit.

The langhoff kit is a towering set up of pipes and glassware that is designed to keep the heart of the rat beating after it had been taken out of the rat's chest cavity.

This is then used to study the beating of the heart to assess its elasticity.

The work conducted by this apt team of scientists is essential with the increase in health problems due to obesity for example metabolic syndrome. The team has already achieved success with treatments such as the purple carrot which is already making a difference in lives of those who suffer from symptoms of obesity. It was great pleasure to have worked with such an accomplished group of scientists.

The placement taught me that any job has its good points and it's bad. There were many exciting moments throughout my placement. These included observing how these rats monitored and making their special diets.

As well as having a chance to see the work of Peter Harris and Noel Knight. There were essential jobs that may not have been as interesting such as stock take, organising MSDS sheets and cleaning rat cages. These jobs, however, was a dull reality that which most industries have to put up with.

Throughout my placement I got to know the wonderful PhD students whom happily shared their work and knowledge with me. I also had the chance to work with another participant- Sophie Cooper. Together we explored the campus finding beautiful Japanese gardens, outdoor exercise equipment, the library and most importantly the cafeteria. This gave us an insight into the everyday life of a university student.

How My Placement Influenced Me

My industry placement was a learning curve which opened eyes to what working as a researcher is all about. It was a rewarding experience that will undoubtedly be very beneficial to my future career. It is for this reason that I am very grateful to have been a part of the PICSE industry placement scholarship.

Acknowledgements

I'd like to thank the PICSE team who organised my industry placement and the camp, without you none of this could be possible. A huge thank you to the university PhD Students who informed me of the different career options that could be taken in science and how I could get there with various different career paths but still end up at the same place. I really appreciate the time taken to try and make my experience at the university an insightful and hands on adventure.

Tamara Gardiner

School: **Lockyer District High School**

Industry Placement: **CSIRO - Tor St, Toowoomba**

> ***"Having very little interest in plant sciences I thought that a week working with CSIRO would be uneventful. Boy was I proved wrong."***

Industry Placement Camp

My PICSE experience began with a short commute to The Steele Rudd college complex at the University of Southern Queensland in Toowoomba. Our week in Toowoomba involved visiting many businesses and laboratories involved in primary industries and science. The week was comprised of the acquisition of knowledge regarding plant sciences with a visit to Vanderfield and the engineering sector of USQ.

At the university we learnt about extracting DNA from plant samples and got to take part in the process itself, which was exciting.

We also were given the opportunity to make ice-cream frozen with liquid nitrogen, received a talk from a leading researcher in the use of paunch in abattoirs and were given a look at the advances in unmanned agricultural aircraft and data collection systems.

Off campus we visited Vanderfield and were given an in depth analysis of GPS steering systems used on machinery and also provided a demonstration of the GPS system in action on a tractor. We visited the entomology labs at CSIRO and also given a tour of the facility at Monsanto which is currently devoted to the prevention of heliothis grub infestations in cotton crops.

The social aspect of the camp was outstanding with a trip to Milne bay aquatic centre, a movie night and many a game of pool with friends.

My Industry Placement

I completed my placement with the team at CSIRO Toowoomba, accompanied by my close friend, Chanelle Jones. Over the course of the week I threshed and cleaned many wheat samples.

We did a tour of the downs after chipping weeds from a trial plot in pampas, we were also let loose on the soil grinding machine, bulked soil core samples and labelled sample bags. The week was tremendous and a true once in a lifetime experience. It gave me an insight into the priceless work which takes place at CSIRO and gave me a new found respect for the plant science side of agriculture.

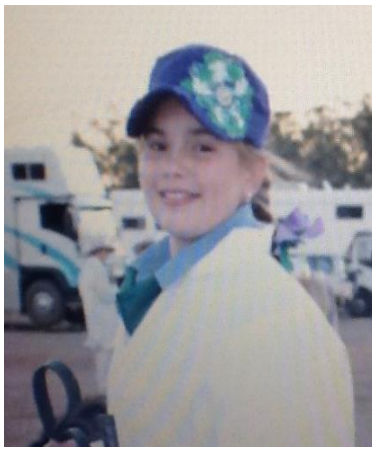
How My Placement Influenced Me

The experience changed my view on certain areas of plant studies and I gained respect for the technicians working tirelessly behind the scenes processing crop and soil core samples to provide Australian farmers with the knowledge to use for efficient cropping and soil management practices.

Acknowledgements

During the placement and camp I met a number of influential people and people who made my experience possible. I would like to thank those who organised my placement, Dr Lindsay Bell for making the placement possible, Neil Huth for transportation, Skye Gabb for showing me how to use the grinding machine and allowing me to be her shadow for the day, John Lawrence for the tour of the downs and trip out to pampas, as well as being a fantastic mentor for the placement and a huge to thankyou to everyone else at CSIRO for welcoming me for the week.

STUDENT REPORTS



Danielle Hunter

School: **Lockyer District High School**

Industry Placement: **USQ - Faculty Health, Engineering & Sciences**

"Opened up many more opportunities within the world of science"

Industry Placement Camp

The PICSE Program camp held on the 1st to the 5th of December 2014, at the University of Southern Queensland Toowoomba, involving visits to many different careers in the science and agricultural industry. Some of what we did included; plant DNA extractions, winery tour, soil science, food technology, precision agriculture, entomology and cotton research. The camp offered many different experiences within the world of science, both on and off campus.

The highlight of the camp for me was meeting new people and when we visited the Queensland College of Wine Tourism in Stanthorpe. Going on a tour through the vineyard, learning about wine chemistry and the basic process of wine making. Another highlight of the camp was when we visited Vanderfield Toowoomba, learning about new machinery that could improve future farming and agricultural research

My Industry Placement

Along with the PICSE program camp, we also completed a week of work experience. I went back to the University of Southern Queensland, Toowoomba, and completed my industry placement in the field of biomedical science. Participating in activities such as; feeding rodents that are used to imitate human disease and trial possible therapeutic inventions using male Wistar rats.

Each group of rats where fed with different diets, for example; one group of rats where fed a high-carbohydrate high- fat diet consisting of beef tallow, sweetened condensed milk, fructose, powdered rat food, salt and water. Another group was fed a corn starch diet consisting of cornstarch, powdered rat food, salt and water. Each rat was individually housed and had full access to food and water; each rat received about 30g of food a day. Along with feeding the rodents each morning, their body weight, food and water intakes where measured.

After approximately 16 weeks on their allocated diet, 12 rats from the high - carbohydrate high-fat diet and 12 rats from the cornstarch diet where euthanized for experiments.

Once euthanized, heparin was then injected. The abdomen was then cut open and blood was withdrawn from the abdominal aorta and stored in an ice box for further testing.

The heart was then removed for Langendorff preparation, used to assess the left ventricle function of the heart. This was measured by inserting a latex balloon into the left ventricle of the heart. The thoracic aorta was cut into rings and where put into an organ bath, a piece from the small intestine and large intestine where also collected for an organ bath. Other organs such as the liver, kidneys, spleen, left ventricle of the heart and the right ventricle of the heart, the retro fat, eppy fat and the ormental fat where weighed. The tibial length along with the whole body length was also recorded for each rat.

Some samples from the rats where processed for histology. Organs such as the heart, kidney, liver, heart and intestines were placed in neutral buffered formalin for three days, they were then dehydrated and embedded in paraffin wax. Once dipped in paraffin wax, they got cut into thin sections; they were then stained to determined inflammatory cell infiltration. Although we didn't have time to get to see this whole process happen, we got to cut some of the old samples, and put them on slides to be stained.

During the week at the University of Southern Queensland other scientists came and spoke to us about their role at the university and how they got to where they are now. We also did a hexane experiment, to improve waste management out of abattoirs. The aim of the experiments on hexane is to break down the fat out of the abattoirs in order to help the sludge at the bottom breathe.

How My Placement Influenced Me

Whilst completing my industry placement in the field of biomedical science, I have learnt valuable knowledge and gained valuable experiences. Although the industry placement and the camp hasn't changed my opinion on my proposed area of study in animal science, but it has opened up many more opportunities within the world of science.

Acknowledgements

During the PICSE program camp and the industry placement, I have made many friends and gained many experiences. To conclude I would like to thank everyone involved in the PISCE Program and most importantly my supervisors during my industry placement.

STUDENT REPORTS

Brooke Johnstone

School: **Beaudesert State High School**

Industry Placement: **Rabar**

> ***"I have developed a stronger interest in studying animal nutrition from my experience and would be interested in pursuing a future career in animal nutrition"***

Industry Placement Camp

The Primary Industry Centre for Science Education (PICSE) industry placement camp, held at the University of Southern Queensland (USQ) Toowoomba campus, was an amazing experience which provided many valuable opportunities for me and the other PICSE students to develop important skills which will aid in our future careers. The camp helped me make friends and gain contacts in a wide range of agricultural businesses as well as learn the different applications of science in the primary industries. I believe it was a very fun and enjoyable experience which encouraged me to think about many other careers that are available.

Although the first day was confusing, scary and everyone was nervous about getting to know new people, by the end of the week all of us were laughing and getting along like best friends. Throughout the week, we all attended information sessions involving soil science, genetic extraction, food technology, wine science, cotton growing and many more. They were all very interesting. I believe the highlights of the camp were definitely when we visited Monsanto and the Brisbane science precinct. On our second day of the camp, we took a bus into Brisbane where we learnt about food science, toxicology, parasitic insects and haematology. I found this visit to be very helpful by demonstrating the different kinds of sciences which can be applied to the primary industries and I was also amazed at the labs which contained many strange objects such as peanutless peanut butter and containers of crawling baby ticks as well as the usual confusing scientific equipment. The visit to Monsanto was also a real eye opener.

I had never really thought about working with insects until then but Monsanto showed me how the close study of moths can lead to the production of moth resistant plants and therefore benefitting farmers and consumers. I was very sad for the week to be over but looking forward to my Industry placement.

My Industry Placement

My industry placement was conducted at a company called Rabar. This company produces the mineral and vitamin components for a wide range of feeds as well as analyses and produces personalised mixes for farmers who want a feed which will provide the exact amount of nutrients their stock requires. Rabar most commonly provides their mixes to dairy farmers but will also make mixes for race & pleasures horses, beef cattle, sheep and many smaller farm animals. On my first day of placement, I learnt the basics for formulating a mix and it is far more difficult than just throwing a bunch of minerals and vitamins randomly into a tub. I had to learn how to enter all the orders into a program which generates a formulation sheet showing exactly how many grams of each product is required. It was also very confusing learning about how each product may contain different concentrations and bioavailability of a vitamin or mineral and how one product may provide more than one component therefore requiring less of another product. On the second day, my placement supervisor, Michelle, took me to a dairy farm which was having problems with mastitis and somatic cell counts and the farmer also believed he should be producing a greater quantity of milk from his herd.

When we first arrived at the farm, it was evident that the cows had mastitis from lying in mud because the water was not running off the property therefore leading to fluctuations in the somatic cell count.

I was then taught to survey the herd using a Darby's sheet which required me to make observations such as percentage of cows chewing their cud and the dryness of their faeces. Michelle and I then had to take samples of silage that the cows were eating to determine the nutritional values.

The silage also contained visible amounts of mould which was believed to be the reason that the cows were not reaching their maximum milk production.

I also had the opportunity to visit a commercial broiler farm which was in the process of testing a new product. The product was made of burnt up plant material and had the purpose of reducing the amounts of ammonia and wet litter in the chook sheds. During the visit, we spoke to the employees and owner of the broiler farm to find out what they thought of the product and how well it was working. We also took a look in the sheds to compare the control shed litter to the shed which contained the product in testing. It was evident that the litter in the testing shed was dryer and also required less turning. I also had the opportunity to measure out and mix a feed during my placement. I had to wear PPE due to some hazardous vitamins and minerals. Overall, I found my industry placement very enjoyable and learnt a lot about balancing the nutritional values of feeds for different animals.

How My Placement Influenced Me

Placement at Rabar has taught me the importance of a properly balanced feed to ensure maximum production. I learnt how the slightest changes in an animal's vitamin or mineral intake can affect the entire production process and consequently reduce the farmer's profit. I have developed a stronger interest in studying animal nutrition from my experience and would be interested in pursuing a future career in animal nutrition.

Acknowledgements

I would like to extend a massive thanks to those who organised this amazing camp as well as the people who prepared the presentations. Thank you to PICSE and USQ for providing this opportunity and hosting us for the week and I would like to express my gratitude towards my industry placement supervisor, Michelle, who provided me with such an interesting experience.

STUDENT REPORTS

Chanelle Jones

School: **Lockyer District High School**

Industry Placement: **CSIRO - Tor St, Toowoomba**

"Participating in the USQ Industry Placement I realise now how big the agriculture industry is and how related everything is to science"

Industry Placement Camp

The PICSE industry placement camp was introduced to me by my Agriculture teacher at my school. Eager to participate in the PICSE program and my interest in science and agriculture I was keen to learn more about agriculture and apply my science knowledge throughout the program. Arriving at the camp grounds we were settled, and then we were greeted by Carissa and many other students that were also accepted into the scholarship, from then I knew that it would be an eventful and interesting week.

Attending the camp it gave me a wider knowledge of what agriculture is and what happens behind closed doors, and gave experiences that explored into the science world. It also gave me the opportunity to meet many great people that came from different schools. The activities that we underwent gave me a feel for both laboratory work and field work, giving me the opportunity to see where I want my future to end up. One of the major standouts on the camp was the visit to the Queensland centre for Forensic and Scientific Research, in Brisbane. The visit to the Research centre made me realise how much goes on in the world of science, and how much we need science. During the visit to the research centre we were taking on a tour throughout the centre and spoken to about the importance of food technologists.

Touring through the research centre we were walked through laboratories and by the time we finished in them I had a change of mind, I thought that one day I'd like to be standing in the laboratory researching, finding solutions to problems, or finding cures for diseases or experimenting.

My Industry Placement

During the PICSE scholarship program I attended a week of work experience based at the CSRIO in Toowoomba. For the week my good friend Tamara and I got the opportunity to work together at CSIRO, we got to assist in different activities like, Threshing wheat, grinding soil samples, sorting soil samples and chipping weeds.

I got to meet many great people who work at CSIRO, such a Lindsay Bell, John, Geoff and many others that gave me the opportunity to join in and help with what they were doing.

Participating in the placement for a week at CSIRO I had the chance to speak with few of the people who work at CSIRO and had the opportunity to ask them questions about how they got to be where they are today.

How My Placement Influenced Me

Participating in the camp and my work placement did not change me or influence any changes to my want to be an Animal Scientist or Vet, I did enjoy myself and gained a lot more knowledge about horticulture and how things operate in the agriculture world. The camp led me to meeting new friends which made my time there very enjoyable, it also made me think that everything in the world is science related, and how important science is to society. Science is basically everything – from irrigating crops to the cotton in our shirts. Attending the camp made me realise how important science is to the world and to us. Science plays a major role in sustainability and making sure that suitable equipment and standards are provided to our farmers. So finding that science is an importance to our world, we should be sure to encourage students, teachers and young children to be aware that science is a major role in life no matter what size.

Acknowledgements

Throughout the camp and industry placement I had the advantage of meeting many people who work in the science industry speaking to us about their related science experiences. We attended many places where we were exposed with information to do with career choices throughout agriculture and how things are done and operated. I would like to thank the ladies who organised the camp and gave up the wonderful opportunity to visit many places, and for organising my placement. And another thank you to the people at CSIRO Lindsay Bell, John, Justin and Geoff who took me on and gave me the chance to contribute and help with their jobs. They were great and outgoing people to work with and provided me with jobs that I could not normally do anywhere else.

Victoria Lake

School: **McCarthy Catholic College**

Industry Placement: **DAFF - Bribie Island Research Station**

> ***"My week at Bribie Island was defiantly not what I thought I would be doing, and really had nothing to do with what I intend to do at university but I enjoyed it and made many memories from my experiences."***

Industry Placement Camp

During the camp there were a number of highlights and enjoyable experiences. On such highlight was meeting the other students on the camp also meeting the people organising the camp and them completing the camp with them. During the camp we visited a variety of different facilities and a variety of informative talks by people who work within the primary industries sector. The week was fantastic and I had the opportunity to see and talk to people that may influence my career path.

My Industry Placement

Monday morning I arrived at the Bribie Island Research Centre having no idea what I was in for or what I was doing. First of all I though I was going to be working in national parks as that was what I was interested, until I was introduced to Peter Lee, Peter was my supervisor for the week. He took me around showing me the labs and the algae rooms, thinking what are environmental scientist doing with algae, the real trip began when he took me to the shed which had fish tanks. Yes fish tanks what was I going to be doing with fish in a national park this is when I asked peter what this place actually was set up for, Bribie Island Research Centre was for Cobia and Jungle Perch to build up the population of them due to it being very low and only found in the higher parts of Queensland.

After the tour was done, I was introduced to Raz, she showed me the Cobias that were about 12 months old and the brood Cobias, which led to my first job feeding them, each feed included getting drenched by the fish splashing and fighting for food if you didn't move away from the tank quick enough, the smaller Cobia were fed small pellets around a centimetre big yet the brood Cobia were fed Pilchard this morning.

Raz also showed me how to test the level of pH, dissolved oxygen, salinity and temperature of water from the tanks.

Next I was introduced to Dave, Trev and Luke. Dave took me and showed me how to fed and weighed the Jungle Perch food, which I was told I would have to know how to do by myself for the next week. Yet it was reasonably easy.

That afternoon was very hands on and also busy, Monday was the day that the Cobias had to be sent away, the fish had to be re weighed and not all of them could fit due each tank could only carry 35 kilograms of fish. Each bucket of fish was weighed and recorded.

After this was finished the only thing left to do was clean up and fed up for the afternoon only the Jungle Perch and half aged Cobias.

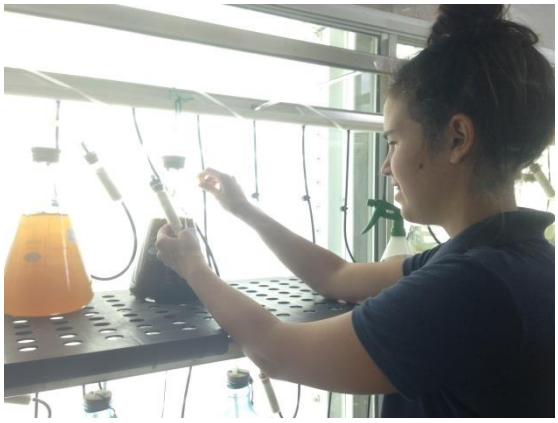
Day two started off with feeding up the younger Cobia, and the Jungle Perch today the were fed small fish about three inches long which had to be cut up in to small pieces and weighed before feeding. The brood Cobia were not fed on Tuesday due to there were getting moved and females tested to see if they were fertile. Then the checking of the water quality testing to make sure everything was normal.

Today I was shown the ponds that were suppose to have Jungle Perch of the age of 20 days but this was unsuccessful so the ponds were emptied, which caused a build up of thick algae this later had to be cleaned due to it was blocked and the water could not go back out to sea. All water used at Bribie Island Research centre is from the ocean and once used goes back out into the ocean but it is tested as not to much nitrogen is allowed to go into the ocean. After this the younger Cobia were fed.

Day three, this morning young Cobia and Jungle Perch today they were fed prawns which had to be cut up also this meant there head had to be taken off due to it being to shape to eat after this the small Cobia in a tank inside were fed, then water quality tests were done this was the morning jobs done. This led to collecting eggs, weighing and moving the brood Cobia into different tanks.

First the fish were given a dose of AQUI-S this gives the fish a light sedition so that the fish can be handled and moved without them being to stressed.

Then the fish were checked by the microchip to see if they were male or female on the machine shown, then if they were a male they were just weighted then put into another tank. If they were female a small tube was put in the uterus and the sucked on softly, the eggs were sat in a specs contain with a number and then sat on ice. After they had eggs taken the female's weights were taken and record then released back into the tanks.



Once all the fish were completed there were three fish that had to be euthanized, due to being to under weight, they were then cut open to see if there was any problems with their lungs or eyes which can cause them to be under weight but none of them had problems, they were just small.

That afternoon was very eventful as Peter showed me how to start new algae cultures which was very interesting this brown algae was used to feed the Robopods which are then used to fed to the Copodas then fed to the Cobia babies. Robopods live off things such as blended yeast and water.

Day four, this morning all fish were fed, young Cobia pellets, small Cobia tiny pellets and the Jungle Perch were fed pellets also. Then water quality tests were done.

Then the small Cobias were moved out of just one run way into two due to not being enough oxygen in the water for them all to survive.

The brood Cobias feed today was Pilchards, but because these fish are in spawning season the Pilchards had to be injected with 1mL of Vitamins, this is done once a week to half of the Cobias food which is approximately 3 kilograms.

Later that afternoon Dave and I tried to harvest Robopods to make two new cultures but this didn't work due to the bags kept breaking and going down the drain.

Day five, in the morning all the fish were fed again, young Cobia pellets, small Cobia tiny pellets and the Jungle Perch were fed Giant Meal worms which are grown in the research centre living off potatoes and paper. After the worms were collected a few of the big ones were left so that they could turn into bugs and make more worms.

The Copodas were harvested today which I didn't really have much to do with by they will get fed to the Cobia babies.

A new Squid and Pilchard box was made by drilling holes in a plastic box so that the water drains out and it's easier to access.

The Jungle Perch's tank bases were cleaned with brushes so that the waste doesn't build up and become unhygienic.

After this a quick back wash of the brood Cobias tanks were done and then pressure washing there filter bags so that the flow was easy.

After this the younger Cobia were fed and the run way Cobia and then my week at Bribie Island Research Centre was sadly finished.

How My Placement Influenced Me

I learnt valuable knowledge from the placement, especially about the many career pathways in marine science. This experience has helped me to make a decision on where I would like to be in the future and the array of opportunities that comes with it.

Acknowledgements

Firstly I would like to say a massive thank you to Carissa Anderson for making this placement possible and organizing it so I was able to go. Peter Lee for being my supervisor at Bribie Island and also Dave, Trev, Raz and Luke for letting me get so involved and not just making me sit back and watch. Also I would like to thank my wonderful mother who travelled 9 and a half hours for me to complete the placement and believing in me the whole time.

STUDENT REPORTS

Emily-Louise Lambkin

School: **Calrossy Anglican School**

Industry Placement: **Talgarth Partnership**

"The experience I received from the university was great!"

Industry Placement Camp

While I was in Toowomba participating in the Primary Industry Centre for Science Education (PICSE) industry placement scholarship program I was exposed to a range of things that broadened both my mind and my understanding of how important and how much there is to do in the agriculture industry. The program showed me that there are so many more pathways into the agricultural industry other than the typical stereotypes that are associated with it.

There are pathways that lead into the industry that you would sometimes believe that they had nothing to do with the agricultural industry or nothing to offer the industry.

While at the PICSE camp they had us do quite a lot of hands on activities but also gave us the opportunity to sit and listen to a variety of different people talk about the various fields that they were in, what they did in this position and how they got there. One of these talks we did we went to Vanderfield and the people showed us around and talked to us about the new GPS technology involved in some of there tractors. One of my most favourite hands on activities was to make ice-cream with liquid nitrogen.

When we were not out and about learning and taking in the experiences of the camp, we were at the University of Southern Queensland (USQ) which was home base for the program and where we stayed for the

week. It was somewhere for us to sleep and have a home for the week but also an experience of what life would be like at the university, if we were to go to it or somewhere like it. The experience I received from the university was pretty great as we got to mingle with everyone that went on the camp, make friends that will last for years to come as well as life long memories. The conversations that were had over meals will also never be forgotten.

My Industry Placement

I decided to do my work placement on a dairy farm, seeming as I am off one I thought it would be good to do my work placement on a dairy farm so I could learn a few more things about the dairy industry that I did not know before. In the morning at 4:00am I would start to get ready so I would be able to make it to the dairy at around 5:00am to start the milking. Once I arrived I was showed the procedure that had to be done every morning to start off the milking. After all the cows were milked we would then feed all the poddy calves with the milk that was left over from the cows that were not allowed to enter the vat. When the poddy calves had been fed we were then given the task of making sure all of the calves were healthy and not in need of any medication for conditions such as the scours, or pneumonia.

On the third day of my work placement the dairy that I was working at had a marking day on. This included ear tagging with both name tags and NLIS tags into younger heifers and some steers, this also included giving them all there vaccinations needed such as the 5 in 1 needle.

This also meant rolling the heifers to make sure they had no excess teats or dummy teats that could hinder there performance of milking in the future. The marking day was then concluded after both the steers and heifers were dehorned.

Being able to have the opportunity to do work placement on the dairy farm allowed me to not only get experience from just milking the

cows but also learning a lot more about the cropping and the pastures that they tend to use and what can help them produce more milk.

While I was there I was also given a talk on why the dung beetles seem to like the dung of the young heifers that have a diet of lucerne as opposed to the heifers that have a diet of Lucerne but also corn silage. Seeing I had an interest in bugs they explained a lot about how they can be beneficial in some areas and how in others they can ruin a whole crop.

How My Placement Influenced Me

This was a very eye opening experience to how things can be done differently and how the smallest things can help on the biggest ways.

Acknowledgements

I would like to thank the PICSE team for the organisation of both the placement and the camp. I would also like to thank Talgarth Partnership Dairy farm for having me and showing me lots of new ideas and innovations that I may be able to use in the future.

STUDENT REPORTS

Mathew McNamara

School: **Warialda High School**

Industry Placement: **Landmark**

"I was able to experience first-hand what it would be like to be a crop agronomist"

Industry Placement Camp

The Industry placement scholarship camp that is offered by picse cotton (primary industry centre for science education) it is a fantastic opportunity, this gives country kids the ability to view the different diversity and aspects of the careers we are able to participate in. It showed us that there are many different career paths we can follow and many more ways to get to the destination.

The trip started at Moree maccas where I meet up with Trudy and Dylan I said my good byes to my family and jumped in a car with two strangers heading Toowoomba way. We spun a few yarns about country life and what we do for fun, conversation was never boring between me and Dylan and we soon became great long term friends.

We arrived at the University of Southern Queensland Toowoomba campus and shortly after met our university dorm supervisors. We went and unpacked and then we found a pool table. Little did we know that every spare second we had we would be playing pool. The look on some of the fellow scholarship students faces was like where are these hill billy's from. We had to cut our game short as we had to go and meet other scholarship students. We sat in a group and had to pick a person to learn something about them.

We then had to stand up say our name, school and a hobbies by the end of this session I realised I was surrounded by fellow agriculture and science enthusiasts.

We all were shown around the campus and given a quick rundown on rules. The days of the camp went quick but I will still remember the memory's that I made with these students. I made many lifelong friends from this camp and realised that there are many opportunities available but I didn't know where to look until the camp. I would recommend this camp to anyone; it's a fantastic opportunity.

My Industry Placement

This placement allowed me to gain an understanding of what it is like to work in a field of agriculture or science which I have an interest in. I undertook my work placement at Landmark in Moree northern NSW with an agronomist.

In the life of an agronomist, my day started at 8am I arrived at Landmark at Moree and Ashleigh was fashionably late as she dropped her phone in a puddle. I help one of the workers open the store and the gates, on completion of this Ashleigh arrived. Once I arrived and settled in at Landmark I was given a general induction by Trish, I was shown around the chemical shed where the dangerous chemicals are, evacuation points, chemical spill drums and all the other occupational health and safety issues. We then got our list of jobs for the day… soil sampling was the first real job of the day; we loaded the soil sampler on the back of the ute. Away we went 40 minute trip to Keytah, we arrived we looked at the map we had 15 locations we had to take samples at.

With the help of google maps we found our destination points. We set up the core collector and we had to collect 0-15 cm and 15-90 cm core samples this is an important task to see what nutrients are available in the soil and determines the fertilisers needed.

We arrived back at Moree where we packed the samples into a freezer. This is just one of the days in the life of an agronomist.

How My Placement Influenced Me

The placement allowed me to gain an understanding of what it is like to work in a field of agriculture or science which I have an interest in. I was able to experience first-hand what it would be like to be a crop agronomist. Admittedly I am more interested in pasture agronomy but this was an excellent experience as I was able to gain an understanding of soil and crop science.

Acknowledgements

Thank you to the PICSE crew for organising both the camp and placement, without you the whole scholarship would not be possible. I also would like to thank everyone at Landmark Moree for putting up with me for the week and answering any questions that I had. Lastly I would like to thank the rest of the students on the camp as you made the camp very memorable.

STUDENT REPORTS

Claudia Turner

School: **McCarthy Catholic College**

Industry Placement: **Veterinary Health Research**

"Working for VHR was one of the most eye opening experiences of my life and I am so grateful for the opportunity"

Industry Placement Camp

My highlights from the Cotton industry placement scholarship camp were being able to see so many different agricultural industries and gaining an insight into what they are about and how they work. Being able to meet different people, from different backgrounds from all over Northern NSW and Southern QLD who shared a common interest in science was fantastic.

My Industry Placement

Veterinary Health Research (VHR) is a research centre in Armidale, New South Wales. This company tests the safety and efficiency of a new animal medications compared to other products already on the market. VHR is the company I was lucky enough to spend a five days of January working for. Over these five days I was able to participate in several of their ongoing trials which allowed me to get a wide in site to how this company worked. Not only did I help in the trials I also assisted with some of their day to day jobs like feeding their cattle and buying livestock suitable for their trials. With this job comes a lot of traveling as most of their trials take place outside of Armidale and on different properties around the region.

The first day of my placement was spent mostly in the office reading SOP's to ensure I knew what the right working practices are.

The day started with their usual Monday morning meeting to plan for the week as well as an introduction. Then I was taken out to one of the VHR farms to collect the quad bike and some chemicals for spraying, this was also accompanied by a tour of the property. When I got back to the office I assisted Jill in counting flies for one of her trials.

Whilst counting the flies Jill taught me about the different types of flies and how to distinguish the differences. In the afternoon I went with Lucy to collect hay to feed the cattle living at one of VHR's properties. Once we picked up the hay we headed for the property. When we got there we had to needle one of the bulls due to a swollen hock, then fed the cattle and returned to the office.

The second day was a lot more hands on and busy. Jill, Tim, Lucy and I all travelled to Dorrigo to run tests on some trial goats. Upon arrival we got to see baby twin goats then it was time to work. These animals had to be bled, FEC (faeces sample), drenched and half were to be vaccinated. I was in charge of writing down if an animal had been vaccinated and/or drenched. Tim taught me how to check the blood for set parasites and towards the end I was taught how to bleed a goat. When we got back to the office Jill and I spun the blood samples and removed the plasma for further testing.

On the third day of work placement I completed reading the SOP's, then went with Jill and Lucy to buy hay for the injured bull and needled him and fed him. When we got back to the office we counted more flies, this time it was a lot simpler and quicker as I knew what I was looking for. After counting I labelled blood, FEC and plasma jars to assist Tim in his study. After lunch I attended my second staff meeting where they put forward things that need to change and talked about sponsors coming for a visit. Once the meeting was over I assisted in giving the lab a slight tidy up then went with James and Lucy to buy sheep for new trials. Before purchase we weighed, vaccinated and tagged the sheep. The first lot of sheep were dropped off at one of the farms and the second were put in sheds at the UNE.

On day four we travelled to a property halfway between Gyra and Inverell to check capsules that were placed inside the rumens of these cattle. Upon arrival we suited up with gum boots and overalls to keep the fluid and stench off our clothes and boots. With the help of some very helpful automatic yards we had the cattle up the race. The steers had plugs in their side which connected to the rumen; these plugs were pulled out when it came time for testing.

Some of the animals were beginning to bloat causing there to be a great deal of pressure on the exploded rumen contents to explode with removal of the plug all over anyone close enough making it extremely funny for Jill and I watching from a safe distance.

By the end of the day we all smelt of rumen and were looking forward to a shower. When we got back to the office it was time for a clean-up and I was in charge of cleaning the buckets. It was a very smelly and messy day.

Day five was a very quiet day with not a lot to do, I got to start later at 9.30. When I arrived Tim taught me about what goes into making a trial and how the trials work. He showed me the trial he had just started. I then accompanied Lucy and James to get feed and coffees for us all. Lucy and I then took the feed out to the farm and fed the bull and looked at the new born piglets. We then had to pick up Jill and go and get hay for the following week. Jill and I got the bull into the crush and gave him another needle.

He was beginning to look better and could walk better. We then took some of the hay and pellets down to the other cattle on the property. When we returned to the office I said my goodbyes and then headed back to Tamworth.

How My Placement Influenced Me

Working for VHR was one of the most eye opening experiences of my life and I am so grateful for the opportunity. It was such a great experience and I enjoyed every second of it. I met some incredible people who have truly changed my life. This experience has shown me where I could go in life and the different ways of getting there. Veterinary Heath has always been something that I have enjoyed learning about. Being able to see that there is more to research then just sitting behind a computer has really opened my eyes. This is a field that I am not strongly considering going into in the future.

Acknowledgements

I would like to thank everyone in the PICSE team for making this camp possible and especially Carissa Anderson for all you have done to make this possible for me. I am very grateful to everyone for making this possible. I would like to give a massive thankyou to everyone at Veterinary Health Research in Armidale for having me come and work for them and for letting me learn from them. This has been a great experience, Thankyou to everyone involved.

STUDENT REPORTS

Dylan Verrier

School: **Narrabri High School**

Industry Placement: **Auscott**

> ***"This terrific experience is invaluable and gave me great first hand experience into the world of agronomy"***

Industry Placement Camp

The PICSE industry placement camp went for a week from the 1st to the 5th of December. We stayed at one of the colleges on campus at the University Of Southern Queensland. During the week we explored the university by visiting science labs, library and the soil centre. I really enjoyed the experience of staying on campus; I think this is a fantastic idea as it gave me a taste of university life. This showed me that yes I could live on campus which really helps me in making a decision for my future. Before I went on the PICSE camp I was trying to decide weather to do a trade or go to university.

Since the camp I have changed my subject selection from construction to biology to open more doorways into university.

During the camp we went to Monsanto, Vanderfield, a food technology laboratory in Brisbane as well as various other places. Despite going to all these different places my favourite part was the day trip to Stanthorpe. At Stanthorpe we went to the Bramble Patch where they make and serve desserts. They also make all their own jams, chutneys, vinegars, jellies, marmalades, coulis, vincotta, fruit pastes, pasta sauces, kassoundi and fortified wines. All these fantastic products are made from no preservatives and most of the fruit and vegetables used in the products are locally sourced. We then went to a winery which I thought would be boring; however it was the most interesting part of the trip.

It was probably so interesting because the only thing I knew about making wine before was that wine came from grapes but not now. After leaving Stanthorpe I was full of knowledge and food.

All in all the camp was great. I really learnt a lot and found out that I would be comfortable leaving home and living with complete strangers in an unfamiliar environment. After completing this camp I would definitely do another camp or even this camp again.

My Industry Placement

I chose to do my week of industry placement at Auscott Namoi Operations a multi cropping farm located half way between Narrabri and Wee Waa. Auscott began in 1963 as a 2800 ha farm which has now become an 8777ha farm. Auscott is the only place that farms, gins, markets and ships cotton. During my fantastic week at Auscott I mainly went around with 2 agronomists and I also went around with some veteran Auscott workers and the marketing man.

On Monday I got inducted and got shown around the farm. I meet majority of the staff that were all really friendly and interested in what I want to do when I leave school.

I attended the weekly meeting which was insightful. Bill and Elsie the agronomists showed me the moisture probes that are in the cotton fields on the computer which is very intriguing. The moisture probes were observed everyday as this helps the agronomists decide when to irrigate the cotton.

On Tuesday I went out in the field for the morning with Elsie. We drove around the fields checking the sorghum and mung beans. Then we went to the cotton fields and checked the nodes, internode length, nodes above white flower and used the beat sheet to check for bugs.

I really enjoyed this - it was one of my favourite parts of the week. Next we attended a budget meeting which I didn't realise was part of Bill and Elsie's jobs, so this was a good thing to attend. I then went with Elsie to check a problem field for weeds. We identified all the weeds and reported back to Bill, he then determined the sprays needed to control the weeds.

Wednesday morning was raining so we did what Bill calls agronomy by ute. Bill showed me the lateral irrigator and showed me what to look for in maize.

After that I went to the have a look at the trash which is a waste product from cotton, I was thinking this was going to be boring. However it wasn't, Auscott has over 33km of trash in rows which is turned into to compost and spread around the farm.

The compost is better for the crops then MAP which is a fertiliser most farmers use. The compost is watered and turned regularly to help the trash break down. I went to the picker shed where they have 3 round bale pickers which they are currently doing maintenance to.

On Thursday the agronomists went to Moree for a meeting so I was left with PJ the marketing man. I went on a gin tour in the morning which taught me the ins and outs of harvesting the cotton.

I then went back and had a talk with PJ about the cotton market which was extremely interesting. This showed me how complex it is to buy and seel cotton. We then got in the car and travelled to Cotton Seed Distributors which is where every cotton seed across Australia goes to be processed. I was taken around and shown how they process the cotton seed and coat it depending on the customer specifications. PJ took me to Namoi Cotton where they grade the cotton. This is a very complex procedure and there are many things that help them grade the cotton ready to market.

Friday I went around with Bill and measured the rate at which the urea was coming out of the silos. We had to measure how much urea was going into the channel and then change the rate if need. We then went and saw if the mung beans were planted in the moisture. The mung beans had to be about 3-5cm in the moisture we had a few problems with achieving this.

This taught me that you have to persevere through unfavourable conditions to achieve your goals. We had to check how many mung bean seeds were planted per metre which was between 28-32, this was favourable.

How My Placement Influenced Me

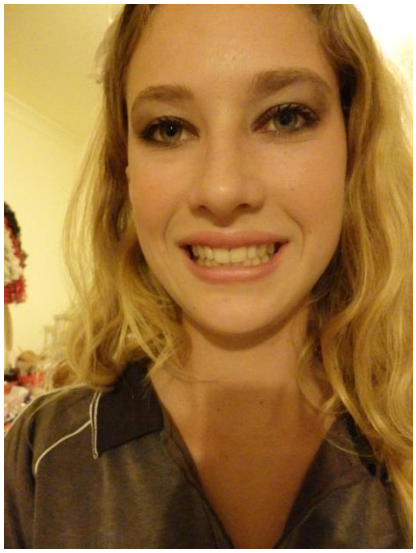
This week at Auscott was the best week of work I have ever done, this terrific experience is invaluable and gave me a great first hand experience into the world of agronomy. When I arrived at Auscott I knew only a paragraph on cotton and agronomy. Now I could probably write a beginners guide of how to grow cotton through to how to market cotton. Before my week of placement I only knew the tip of the iceberg of what agronomist do.

On Monday afternoon I was scared with how many things they have to do and know; now I am excited because it is such a surprising and interesting job. I also learnt how to check the bugs on cotton, determine when to irrigate cotton and suggest when it is best to buy and sell cotton. As the final day came to a close I felt a strong sense of achievement. In this great opportunity to work on this well known farm I had learnt more in a week, then I have learnt in any week of my school life. The skills that were taught to me by these fantastic people are unique skills that I hope to use again. Before going to Auscott I was 100% set on what I would like to do as a career. I now have a sense of direction, which not many 16 year old students have.

Acknowledgements

Thank you to the PICSE team for making this eye opening experience possible, without you the tours or placements could not happen. Thank you to all the wonderful people out at Auscott for showing me the cotton industry and showing me that there definitely is a future in the agricultural industry. I am truly inspired to pursue a career within the agricultural field.

STUDENT REPORTS



Vanessa Walker

School: **Lockyer District High School**

Industry Placement: **Withcott Seedlings**

> ***"My time spent at Withcott seedlings has helped my decision in becoming an agronomist and possibly majoring in horticulture"***

Industry Placement Camp

The PICSE Scholarship was offered by my agricultural science teacher. I thought it would be a great way for me to find out more careers in the industry. But this was only the beginning; I made great friends, found more information about careers I knew about and found out information on new careers too.

We visited great places that were very interesting. These companies and groups walked us through their jobs, gladly telling us about themselves and how they got there.

Some of these companies include Vanderfield, Queensland College Wine Tourism, Leslie Research Centre, Monsanto and Murray Darling Basin Authority to name a few.

I wish that we could have visited more places that offered more insight in to all parts of the agricultural industry to see both the animal and plants side of the industry. My only negative part of the camp was that I had to leave. It was a great experience for me and I learnt lots of information about my future career options.

My Industry Placement

My placement was at Withcott Seedlings, a local seedling company that competes at a state level.

During my week at Withcott Seedlings I learnt many different things about horticulture. There are many diverse things to learn, like seeding, grafting, counting, thinning and moving the trays ready for delivery.

I was taught how to graft tomato plants by Irene, which was very enlightening. How the cuts had to be diagonal to increase contact of the two parts and the plants had to be placed in a room at 80% humidity and 25˚C. After being in the room for 5 days it was moved to 75% shade, 70% humidity for 1 day then moved to 50% shade, 70% humidity.

Malcom the agronomist showed me around the nursery checking the seedling moisture and the health. Malcom had to devise the amount of water and nitrogen for each group of seedlings. The amount of nitrogen needed depended on the stage of the seedling, either 1, 2, 3 or 4. In stage 4 the plant will get less nitrogen to “harden” it off, so it will survive when the farmer plants it. Other variables can affect the amount of nitrogen needed, like rainfall, diseases, pests and weather.

Vicky taught me how to thin seedling trays. Seedlings had to be separated so there is one plant in each cell and then I had to remove the empty cells and replace them with seedlings from the filler tray. Then I went to count seedlings, which advises the farm whether or not there is an excess or shortage for the order.

On my last day I help with seeding. The trays had to go through a machine that placed a seed in each cell. The machine was not accurate so I had to go through the tray and remove extra seeds from each cell and add a seed to any empty ones.

How My Placement Influenced Me

My time spent at Withcott seedlings has helped my decision in becoming an agronomist and possibly majoring in horticulture. I realised that there is more to the care and planting of seedlings which are quite ingenious and fascinating. I will take this experience and use it in the future to decide my career. I loved and enjoyed the work and hopefully return in the near future.

Acknowledgements

I would like to thank you to all the people who organised and supported the camp and my placement. Thank you to the companies and groups that allowed us to walk through their work to educate us in their work place operations. Thanks to Withcott Seedlings for allowing mew into your work place to gain knowledge in agronomy and horticulture.

Kate Lumber

School: **University of New England**

Industry Placement: **Australian Cotton Research Institute**

> ***"I had the most amazing week out at the Australian Cotton Research Station!"***

Who am I?

My name is Kate Lumber and I am a fourth year Rural Science undergraduate student at the University of New England, calling Tamworth in Northwest NSW home. I have developed a strong passion for Cotton over my time working as a crop scout, or fondly known as a bug checker in Moree and throughout my university Career. I have been lucky enough to be mentored by some amazing agronomists that have really inspired me and as a result I would ultimately like to enter into Cotton Agronomy upon the completion of my studies. I feel so privileged to have be awarded the PISCE Cotton Internship and sincerely thank all those involved and the funding bodies that made this placement possible.

Day 1: Entomology

I met with station manager David Halliday and was given a tour of the facilities and a site induction. He gave me a briefing on the outlay of the farm and the cotton in this season. I then met with entomology researcher Sharon Downes and we discussed all things insects. She briefed me on the history of entomology research, the introduction of GM cotton, Helicoverpa resistance monitoring and the research currently being undertaken at ACRI in the field of entomology.

She then gave me a tour of the entomology department where we discussed current research practises and the lab work being done currently.

I then headed back to the lab and met with Tracey Parker where she showed me the diets and procedure with removing pupae and plating larvae. I then completed these tasks alongside technicians. After lunch we headed out into the field collecting Helicoverpa eggs, bringing them back to the lab where I placed them on diets. What a day and a great insight into the methods behind resistance testing for Heliothis in Cotton.

Day 2: Plant Breeding

I met with lead researcher Warwick Stiller to discuss plant breeding and its role in the Cotton Industry. He briefed me on the history of plant breeding in cotton, Industry breeding objectives, the techniques for conventional breeding and biotechnology practises and the research currently being undertaken at ACRI in the field of plant breeding. He then took me over to the plant breeding shed where I met with Jo Price and the team to begin work for the day. I was first shown germination tests conducted on new lines. Some performed well and others showed a low germination percentage, raising concerns with the current establishment issues seen in the industry. Then to my delight we were out doing fieldwork! We were "rogueing", which is identifying the plants that were not planted in a given trial having come up from last year's crop. Apart from the fabulous weather it gave me a great opportunity to quiz everyone on the trials as we walked through them and their career paths and experiences in the industry which was truly invaluable. When we returned I was shown the heat treatment we had discussed to test for dormancy in the seed the showed low germination percentages earlier in the day and then I learnt to prepare the seeds and lay them. I was then given a tour of all the ginning facilities and was walked through the sample process for each SBS sample. I have been through a commercial gin so it was interesting to see the contrast between that and the ginning process at ACRI. I finished the day having met some fabulous people and receiving a great insight into plant breeding.

Day 3: Pathology

I met with technical staff Beth Cooper and Sharlene Roser from the NSW DPI and was given an induction and tour throughout the lab facilities in the Pathology department. Today was a stark contrast to any of my experiences in the cotton industry to date. My experiences have been based in commercial and production agronomy so being in an industry analytical lab was surreal. Alongside trials conducted at ACRI they also investigate cotton pathogens and disease through area sampling and monitoring. The samples are then brought back to the lab and processed giving a good snapshot into the change of infection from season to season. Firstly Sharlene took me for a tour of the greenhouses and then the field trial sites on farm, which was a great way to start so I got a feeling for the commercial application of the lab work we completed for the rest of the day.

Back in the lab I was taught and completed isolations of fungal plant pathogens causing Verticillium root rot from both cotton stems and soil samples. I also made ESA Agar and Chlorotetracycline Antibiotic Stock Solution, which was a great experience on lab technique.

I was also able to observe the method of grinding and preparing soil samples. I finished the day having met some great people and receiving a first-hand insight into an industry based research laboratory.

Day 4: Physiology/Agronomy

I met with Phoebe Carter and CRDC Summer Scholarship recipient Sharna Holman and we headed out into the field with a team of other ACRI workers for a fun filled morning of sampling. We were leaf discing which involved taking four samples from one leaf, three leaves per trial to be taken back to the lab and analysed. The trial we sampled was looking at heat tolerance attributes and the heritability of this trait. This was a fantastic practical skill to gain. After lunch we met with head agronomist Michael Bange. We went out and were given a farm tour where he discussed current agronomic challenges and the research currently being undertaken in his department. We got in the field looking at some dryland trials, which was of great interest to me as I am undertaking my honours project on phosphorus nutrition in dryland cotton. We also saw some exciting developments to climate change research, even jumping out to start a siphon or two. After completing our tour we came back to the office and had a chance to discuss my goals and career aspirations, getting some great tips when applying for jobs and skill building. Michael also took the time to introduce me to Dr. Ian Rochester, Principal Research Scientist and I made a time to meet with him the following day. What a fun filled day!

Day 5: Bio Pesticides and Semio Chemicals

I met with Alison Young in the insectary and was shown around the lab. I then went out with technical staff member Tommy Palmer and prepared a field site for a trial going in under cages looking at the use of fungicide based sprays to control Helicoverpa. We then came back and tended to the mirid population; including the separation of nymphs and adults, feeding, watering and collecting eggs. I was then taken down to the Semio chemical lab where we scored plates in a trial looking at the use of fungicides sprays to control Helicoverpa. Three days following application we established which replications of each treatment were alive, sick or dead. It was a great chance to see the start of the selection process in this petri dish trial to the end of the selection process in the field trial as seen earlier. We were then joined by Robert Mensah who outlined the current research and developments being undertaken in his department. After this I went over to the plant breeders shed and helped out for a while, measuring plant leaf area for a photosynthetic study. I then had my meeting with Ian Rochester.

I gained a great knowledge on Cotton nutrition and had a chance to discuss my honours project and the expected results which was truly invaluable.

What a great way to end a fantastic week. I learnt so much, left feeling more confident about what my honours trial and had met some fantastic industry contacts at the same time.

Where to from here?

I had the most amazing week out at the Australian Cotton Research Station! I met some fantastic Industry contacts, saw and sampled some exciting new research and simply learnt so much. It confirmed my love for the agronomy and physiology of the crop and gave me exposure to the technical side of research and laboratory work. It confirmed that I want to be out in the crop doing field work following the competition of my studies, whether that stems from research or commercial opportunities. I would love to come back and spend some further time learning from the incredible researchers I met on my placement. Everyone was so knowledgeable and approachable, thank you for taking the time to spend with me. This really was a once in a life time opportunity of which I am so grateful. I would like to say massive thank you to CSIRO, CRDC, NSW DPI and PICSE Cotton for this amazing opportunity!

Penny Wright

School: University of New England

Industry Placement: Tamworth Agriculture Institute

> ***"They have inspired me and further educated me in the small time span of a week"***

I applied for the PICSE internship as an Environmental Science Undergraduate, and although it is aimed at more agricultural related degrees, I found that soils was an attraction of the program and highly related to my degree. So I applied, and to my surprise, received an internship. The program has really enhanced my practical skills, which is essential in my degree as an external practical component is not required, and therefore is not usually undertaken. I thoroughly enjoyed my week of soils and would encourage every agricultural and environmental student I know to apply for the internship.

In December 2014, from the 15th to the 19th, I was given the opportunity to gain some work experience in the area of soils. I began the week with Graeme Schwenke, a tour around the campus, and a rundown on the appropriate fire and safety regulations. As the soils staff had already left for the field I settled into some grains work, weighing and sorting.

When the soils staff returned in the afternoon, I was pleased to work with them, and helped weigh out some cracking clay soils which would determine soil moisture content from a sorghum crop at Breeza, about an hour from Tamworth. On the Tuesday I accompanied the soil staff out to the property at Breeza and helped sample the sorghum crop, taking soil cores, 10 in each plot, one at 10cm and another down to 20cm. We returned in the afternoon to weigh these new samples, and separate them into samples to be dried, and others to be assessed for other soil components. The Wednesday consisted of another trip into the field at Breeza, this time taking gas samples which were taken from pods on top of the soil, using syringes and airtight viles. These samples were taken as part of a project to assess the emissions of N_2O, a greenhouse gas, from cereal crops. The large global issue of greenhouse gases is what has prompted this project, there is also other projects assessing the greenhouse gases from stock, CH_4, and of course CO_2. We also spread varying levels of fertilizer across different plots of the sorghum, to determine if there are different emission levels of N_2O from varying applications of fertilizer.

The Thursday proved even more interesting, when I was shown the gas chambers in the nearby plot at the TAI. These gas chambers are fully automatic, and open and close on their own, as well as taking gas samples every hour. The chambers are large and cover an entire plant or two, and are able to relay the information to a computer program which can be accessed from the TAI itself. There is also a backup generator in case of a blackout, so that the chambers can continue to function. Friday consisted of some in house tasks, including labelling the gas vials, mixing some KCL, removing soils from the heating chambers and some more weighing. The weighing is also automated, where the weight is automatically transferred into excel on the nearby computer.

During this week at the TAI, I learned a great deal about the GHG Nitrous Oxide and its emissions from soil. I also learned the specialised sampling techniques, including manual and automated gas sampling and simple core sampling. It was great to learn about this project and have these technologies at hand; they enable sampling to be more consistent, eliminating some human error. It also enables the project to be reliable and representative, as there is more repetition, and the samples are able to be taken at all times of the year.

If anything, improvements could be to adapt the automated system for gas sampling to the Breeza plots, which of course depends on funding, as does everything. However, it would be fantastic to get these samples more often and with even greater consistency. The staff at the TAI are genuine hard working people, who love what they are doing. They have inspired me and further educated me in the small time span of a week. Perhaps this PICSE internship program could have a rotation program, where a week could be spent at two or three institutions in the area. However I loved the week I had and Carissa has been a wonderful host and organiser. Thank you for this week!

Bernard Walker

School: University of Tasmania

Industry Placement: EcoSciences Precinct

> ***"My internship was an invaluable opportunity both as an experience of working in the plant pathology field, and as a networking opportunity"***

Day 1

On the first day I met with Linda Smith at the Ecosciences Precinct 9AM. Due to some problems between UTAS and DAFF regarding work health and safely insurance paperwork, I was unable to do any hands on work, as I was uninsured. So Linda and I completed my occupational health and safety induction, and took me around the whole building.

I was introduced to leading scientists and given an insight into their daily lives and current projects, which was a constructive experience for me. Linda also showed me a project of hers that was examining if infection by *Fusarium verticilloides* spores through the stigma of cotton flowers was causing hardlock of the cotton bolls. Results were looking promising, and it also appeared that insects within the greenhouse were spreading the *Fusarium* spores to other flowers.

Day 2

On day 2 my paperwork was completed, and I was able to go to Toowoomba for a meeting with Linda and 3 of her colleagues to meet with and Elder's business representative. They discussed many projects and new pathology problems in the Darling Downs.

This was a valuable opportunity for me to witness how industry and government research come together to solve agricultural challenges. I also learnt that expert researcher's opinions on the same subject can be very different, even when they have access to the same data and results. I also learned often claims made products that companies produce and trial are rooted in very poor clinical trial practices, and to always either look at the data and experimental design in person, or run a trial of the product to validate the truth of the claims.

Day 3

On day 3 I assisted Linda in inoculating some cotton flowers with *Fusarium verticilloides* spore solution. We collected aerial mycelia from a sporulating pure culture of *F. verticilloides* on agar, and suspended it in a solution of distilled water. An inoculating loop was then used to place a small amount of this solution on the stigma of the cotton flowers. Inoculated flowers were then tagged.

I also attended another meeting in which an expert came in to deliver a new software tool for plant disease identification and surveying to Linda and her plant pathogen surveying team in preparation for testing it in an imminent disease survey of the Darling Downs. The new software is called PestPoint, and among its many potential uses, it promises faster identification of plant diseases, pests, and environmental plant health problems as well as easier pathology surveying. It was exciting to see the future of diagnostic plant pathology and the technology seems very promising to me.

Day 4

On day four Linda and I did set up a trial comparing the effectiveness of two new fungicide/ equipment wash-down products on *Fusarium oxysporum* spores relative to Farmcleanse, a current and widely used farm equipment wash-down chemical.

We then weighed out twelve 3 gram repetitions (reps) of autoclaved soil, 3 for each treatment (product 1, product 2, Farmcleanse, and control). The reps were then inoculated with spore solution. We made up the *Fusarium oxysporum* spore solution to a known concentration by counting the spores under a microscope with a haemocytometer, a technique I was familiar with from my University studies. We then added ten squirts of chemical from a spray bottle to each rep. A positive control treated with Farmcleanse was also made in this manner, and our negative control treatment received 10 sprays of distilled water.

The treatments were then incubated at 25 degrees C for a week, and I am told that the results of our work are promising.

While doing this work I learnt about the importance of washing down your equipment, such as boots, earth working equipment, and vehicle tyres, to avoid spreading soil borne pathogens, such as *Fusarium oxysporum.* It was also another example of how to set up a relevant and reliable experimental design.

Day 5

On day 5, I also primarily did lab work. I spent much of the day subculturing old *Fusarium oxysporum* cultures onto fresh plates in preparations for conducting Vegetative Compatibility Group tests (VCGs) to help determine the strain of *F. oxysporum* cultures.

Although the work was repetitive, I have always enjoyed the technicalities and precision of working aseptically with bacterial and fungal plate cultures, and I therefore enjoyed the work. I was also able to spot some contaminated plates and carefully subculture then in an attempt to produce a pure *F. oxysporum* culture for testing.

Earlier in the day I was also given the opportunity to be introduced to identification of plant pathogenic nematodes by an expert in the field. She showed me a sample of nematodes that she had extracted from an infested vineyard that had two plant pathogenic species in it, the root lesion nematode (*Pratylenchus sp.)* and citrus nematode (*Tylenchulus semipenetrans)*, as well as some harmless free living species. I was then shown how to differentiate the two species, as well as their male and female forms by the shape of their stylet (mouthparts), gut, tail, reproductive organs, and how they move. The differences between the two species were incredibly subtle, and the first expert who looked at the sample mistakenly believed that there was only one species present.

I found the nematodes fascinating, and have great respect for the nematologists and their wealth of experience allowing them to correctly identify nematodes.

Conclusion

My internship was an invaluable opportunity both as an experience of working in the plant pathology field, and as a networking opportunity. I thoroughly enjoyed my time with Linda and her colleagues, as I was invited back to do more volunteer or paid casual work in the future, and offer I seriously consider taking up.

Rebekah Watson

School: **University of New England**

Industry Placement: **Australian Cotton Research Institute, CSIRO**

> **"I had a lot of fun working as a part of the cotton pathology team and gained the really valuable experience and insight into the cotton Industry."**

Recently I had the honour of being accepted for the PICSE Cotton Industry Internship and had the absolute pleasure of working with the Cotton Pathology at the Cotton Research Institute in Narrabi. During the week I was able to experience many aspects of what it means to work in a cotton pathology lab and how pathology and diseases effect the cotton industry. I gained practical experience working in the laboratory, conduction sample dilutions, baiting diseases and purifying them on agar plats, as well as experience in the field, collection various samples. In this report I will outline what I experienced and learnt each day.

Day 1

I met the pathology team, the boss Karen Kirkby, Peter and the lab technicians Sharlene, Beth and Tenayah.

Sharlene set to work rehydrating the roots of cotton seedlings taken from a number of different properties, which were suspected to have black rood rot (*Thielaviopsis basicola*). Each root sample was then cut into 5 approx. 1cm pieces and placed inside pieces of carrots which had been grated, cut into pieces and sliced most of the way down the cortex. The carrots were then tied with rubber bands and placed in a container with 2mL water. Black root rot grows well on carrots and each sample will be checked for the diseases growth in a week. If the disease is present it will be used to make a pure culture which is used for a bank of strains of the disease.

Day 2

I entered data for an experiment to see how far black root rot spread when only one plant in the centre of a patch of plants was infected, and if various watering and rain conditions affected the results.

Tenayah and I spent the afternoon weighing 220 dehydrated root and stem samples taken on surveys from around the state from the week before I arrived and also entered this data into the computer.

Day 3

I rehydrated leaves to test for Alternaria leaf spot (*Alternaria alternate, Alternaria brassicae*). We then took agar out of the auto clave and poured it into plates to culture the rehydrated leaves on the next day.

Some cultures of black root rot collected from samples from the previous year had become contaminated, so I was asked to subculture them onto new anti-bacterial agar plates which would only allow the black root rot to grow.

This involved setting up and working in a laminar flow under aseptic conditions. A small triangle of agar was cut from the edge of the original sample colony, where the black root rot had the most growth and spores, while care was taken to avoid the contaminated spots. This piece of agar was then placed carefully into the centre of the new antibacterial agar plate, which was then sealed with parafilm and placed in an incubator.

Day 4

I went out into the fields at ACRI with Peter and Tenayah to take samples. From the centre of various plots we measured the number of cotton plants in 2 parallel meter lengths and dug up 5 plants, which were assessed for disease and the stems and leaves were placed in the dehydrator to have their dry weights taken later. Some treatments included having various crops on the plot beforehand such as maize, corn, cotton and wheat and fallow and leaving wheat stubble.

Put soil samples in envelopes to air dry. Samples were taken from the top 10cm of soil and second 10cm of soil and to the rig the and left of the row of seedlings. These soil samples are to be used to test for vert and will be used for dilution plates on an antibacterial agar.

We used the the leaves I rehydrated the other day to make cultures to test for Alternaria. We looked for white spots with dark purple outlines. The leaves were surface sterilized by washing them in a bleach alcohol solution for a minute, then rinsing them in water for 3 times for 3 minutes. We then cut out the spots and put them on 10% PDA agar and V8 agar, with 2 reps on each plate type for each property.

Day 5

I went to a property just out of Narrabri to take soil samples 1-10cm deep and 11-20cm deep at 6 set GPS points in a field. There had previously been an extreme case Verticillium Wilt *(Verticillium dahliae*) in certain parts of the field. The farmer had been growing grains the last few years instead and wanted to know if there was low enough amounts of viable Verticillium spores in the soil to plant cotton again.

I made water inoculums by getting a plate of black root rot, putting distilled water in it, and gently scraping the spores from the surface with a glass spreader. This was then poured through muslin and then made up to 300mL. This solution was then diluted by half until a ccf/g of about 100 was reached. This was calculated by using a counting slide.

The last thing I did was plate on carrot juice agar inoculums of black root rot stored in distilled water for various times to see if they are still viable, as it is supposed that stored in distilled water spores are only viable for 3 months, so spores from 1 month to 1 year were tested.

I had a lot of fun working as a part of the cotton pathology team and gained the really valuable experience and insight into the cotton Industry.

Joe Druce

School: **University of New England**

Industry Placement: **Auscott, Narrabri**

> ***"The week that I spent at Auscott was highly educational and very insightful into the corporate structure of a large cotton company."***

Day 1

We began the start of the week with an induction with the Assistant Manager Martin Mead. Here Martin was able to get a hold on the background of both myself and Dylan and what it was that we were interested in. We were then given a brief rundown of Auscott operations. Auscott have a varying range of crops planted consisting of corn, cotton, sorghum and mungbeans during the summer, whilst having recently finished their winter harvest of wheat, durum wheat, chickpeas, safflower and canola. After the induction was completed we were introduced to the head agronomist Bill Back who we spent the rest of the week with.

The main part of the first day was sitting in on the supervisors' weekly meeting which I found very interesting as it gave me an inside into the organisation that must be done every week across such a large corporate farm. There were supervisors for the farms along with the workshop, gin and picker shop, just a few of the many members that make up their Auscott team.

Day 2

We started the day by having a look at the corn that was planted under their two lateral irrigators. I found this to be very beneficial, as I have never had any experience with corn during my working life. Bill was able to unload some great knowledge about the tasseling stage and the seed fill of the corncobs. There was some damage to the cobs from some bugs but the cobs had a large size that means they will be hoping to have a high yield that would be ideal.

After the corn check Bill showed how to check cotton correctly. I conducted a bug check where I found Aphids and Mirids that were present in the cotton fields. We also checked how many nodes the cotton plants had, the internodes lengths, the nodes above white flower and also the top 5 retention which was all recorded to see the various stages that each field was in. We also found some cotton plants that were suffering from Verticillium wilt that slows the flow of sugar and nutrients through phloem, and the flow of water through the xylem.

Stephen Mill gave us an expert run down on the use of Auscott's recently purchased Gold Acres spray rig that had the new weed seeker technology on it. I found this to be amazing in the fact that it would have huge savings in reducing the amount of expensive chemicals need through direct injection.

The afternoon consisted of looking at the reading that their soil probes that give information about the moisture levels within the soil, which is sent and stored on the agronomists' computer. This was highly educational as it could be seen that once a watering had been completed the moisture line would climb rapidly on the chart and as each day went by there was a drop moisture, due to the temperature and usage of moisture by the cotton plant.

Day 3

We checked the corn again focussing on the moisture that was present in the soil that showed that one end had adequate sub soil moisture and the other end was needing a drink soon. There had been a significant bit of rain that came through the farm that sent us flying back to office so as to not to get stuck out there.

Brett “Bert” Sheridan gave us a thorough run through at the picker workshop. The new John Deere round baler cotton pickers are a spectacular bit of machinery but also complex in operation and great for transportation. It was great to get an idea on how to operate one of these huge pickers, hopefully getting to drive one at picking this season.

The afternoon consisted of checking out the compost operation with Chris Pearse. This is the cotton trash from the gin that is laid out in long rows, it is Chris’s job to come along with a machine that turns it over whilst spraying water into it to continue the microbial breakdown of the compost. It was phenomenal how much heat that the compost was able to produce during the breakdown process, having an optimal temperature of 65°C.

Day 4

The agronomists headed to Moree for a conference so we spent the day with PJ Gileppa who is the main marketing officer for the Namoi Auscott. We started the day going through the daily market reports that PJ receives from the main office in Sydney. It was great to be able to decipher all of the complex information that one of these reports has with a varying price index on the market for cotton.

Mark Noble later gave us a tour of the huge cotton gin that Auscott has on farm. Inside the gin they have six Continental Triple 2 ginners that clean all of the cotton. It was fantastic to see the process that the cotton undertakes to being packaged and sent out on trucks.

PJ later took us to see Phil Armitage at the Cotton Seed Distribution (CSD) centre. All of the Bollguard cottonseed that is planted in Australia is distributed from here and sent out all across Australia, where our cottonseed comes from. The cleaning and inoculating process that is completed here is amazing in the amount of tonnes of seed that are processed there every year. They also have a science lab that they use for trailing and developing new cotton varieties.

The afternoon was spent with Ross Brown from Namoi Cotton. Ross gave us a thorough tour of the Cotton-Classing centre at the Namoi Cotton office. It is here that the Namoi valley cotton is classed into the varying different grades based on fibre colour and trash content. The cotton samples are then processed by a machine that will give information on the staple length, micronaire and strength of the fibres so as to give the cotton a grade and the adequate price for the farmer.

Day 5

Our last day consisted of very comprehensive inspections of mungbean planting. There was a limited amount of moisture in the soil to it was vital that the mungbeans were planting deep enough in order to be in that moisture for a greater percentage germination. The rate and planting depth were vital to allow for a successful planting.

The irrigation for the cotton had begun again during the day so we had to go and calibrate the fertiliser silos to get the correct rate to be applied to the field. This involved getting a sample for 30 seconds and then pouring this into a bucket to get the amount of litres that were being applied to the water that was compared to a chart and hence given a rate.

Conclusion

The week that I spent at Auscott was highly educational and very insightful into the corporate structure of a large cotton company. Bill was able to show me some very valuable agronomic methods that I will be able to apply in the work place and when our family is able to grow cotton again. The cropping rotation and weed management was a great process to learn as Auscott is a leading farming company throughout Australia. Would just like to thank Martin and Bill for having me for the week and the program for giving me the opportunity to experience what it is like to work in the cotton industry.