

Smarter Irrigation for Profit Rural R&D for Profit Program

Grower-led irrigation system
comparison in the Gwydir
Final Report RRDP 1606

Gwydir Valley Irrigators Association Inc.

1st July 2015 to 31st December 2017

Louise Gall



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Plain English summary

Project title	Grower led irrigation system comparison in the Gwydir Valley
Grantee	Gwydir Valley Irrigators Association
Partner organisations	Auscott Limited Australian Food and Fibre and Sundown Pastoral Company
Communications/ media contact	Lou Gall, lou.gall@gvia.org.au , 0427 521 498
Project narrative	<p>Grower-led irrigation system comparison in the Gwydir Valley aims to collect commercially relevant comparative data on different irrigation systems. There were two parts to the project, an irrigation system comparison and an investigation of irrigation optimisation under different row configurations.</p> <p>The intention was to provide growers improved understanding of the implications for capital investment, management and the resource requirements (water, energy and labour) associated with different cotton irrigation systems and new technologies. Incorporated into this is the adoption of automation technology and different approaches to farming systems.</p>
Objectives	<p>To provide growers commercially relevant data on alternative cotton irrigation systems including; furrow siphon, bankless channel, lateral move and sub surface drip, and their management. The trial and extension program focused on:</p> <ol style="list-style-type: none"> 1. Improved grower understanding of design, operation and best management of alternative irrigation systems for cotton. 2. Increased grower knowledge and understanding of the water, energy and labour resource requirements of alternative irrigation systems whilst optimising productivity. 3. Increased awareness of irrigation performance and evaluation of irrigation systems. 4. Increased capacity of growers to make informed infrastructure investment decisions. 5. Increased grower ownership of research by developing grower and industry partnerships. <p>This data has enhanced the understanding of the main drivers for change. Helping growers manage the resources of water, energy and labour, has and will continue to help to increase profitability, resulting in a more resilient and competitive cotton farming system and an environmentally sustainable cotton industry.</p>
Locations	<p>2015-2016: Sundown Pastoral Company – Keytah</p> <p>2016-2017: Auscott Limited - Midkin and Australian Food and Fibre Limited - Red Mill Moree</p>
Key activities	<p>The project incorporated trials to be run over two seasons with:</p> <ul style="list-style-type: none"> - 2015/2016: The Keytah system comparison trial for sub surface drip, lateral move, furrow siphon and bankless channel and - 2016/2017: Optimised furrow siphon irrigation system through the implementation of a row configuration trial and an assessment of automated siphon options. <p>Similar methodologies have been utilised for each trial to measure, monitor and communicate the results and benefits. The key activities included:</p> <ul style="list-style-type: none"> - Establishing a project steering committee to over-see the grower-led approach and technical aspects of the trial. The GVIA committee approved project budget expenditure and actions as recommended by the steering committee. - Utilisation of capacitance probes to monitor soil moisture and flow meters at the head ditch and tail-drain of fields to measure all water on and off each system at Keytah in 2015-2016;

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	<ul style="list-style-type: none"> - Initialisation of capacitance probes to monitor soil moisture and flow meters at the head ditch and tail-drain in the trial field, to measure all water on and off each of the different row configurations at Auscott in 2016-2017; - The utilisation of alternative of water-use efficiency assessments such as Variwise, Irrimate and IrriSat; - Maintenance of records of the water applied and the rainfall throughout the season; - Collection, where possible of labour and energy costs for the systems; - Collection of yield and waters use for each the different irrigation systems; drip, lateral, siphon and bankless. Analysis of the data in 2015 - 2016, and incorporation of findings into previous three years of results; - Collection of yield and waters use for each the different row configurations in 2016-2017. Analysis of the yield results and water use for the different row configurations and incorporate into previous results. - Collection of feedback from growers on the project's ability to achieve outcomes through surveys at field days, presentations and at industry events; and - Develop a tailored communication strategy including; <ul style="list-style-type: none"> • the timing of field days or workshops including conferences; • opportunities to deliver results to the industry; • social media and internet promotion activities; (upgraded GVIA digital marketing system) • update promotional information packs with new results and new flyers;
Outcomes	<p>The Grower led irrigation system comparison in the Gwydir Valley has provided growers with independent commercial data which has increase their capacity to make informed infrastructure investment decisions at both a system and within field scale. Being grower led provides broad ranging benefits including improved grower ownership of research, enhanced industry and individual partnerships and cross sector collaboration. An improved digital marketing system has increased the extension of the information to a broader audience and the frequency with which updates can be provided to industry.</p>
Implications	<p>Improved grower understanding of design, operation and best management of alternative irrigation systems will enhance the long-term sustainability of the irrigation industry and increase the smarter adoption of the best technology by growers. Only commercial trials of this nature provide realistic data that is relevant over time. It also challenges preconceived ideas of the most appropriate irrigation systems for industry.</p> <p>Increased grower knowledge and understanding of water, energy and labour resource requirements gives growers more confidence in decision making, providing evidence to support more strategic investment in irrigation infrastructure and thus the capacity to make decisions to ensure that they remain productive into the future.</p> <p>From an irrigation industry perspective, the information collected provides both industry and the broader community a better appreciation of the commercial limitations of the different cotton irrigation alternatives. This is important in helping to ensure Australian agriculture invests appropriately in irrigation technology into the future.</p> <p>Automation of irrigation is of increasing interest to the cotton industry, but the integration of the various components into different automated designs needs to be more thoroughly understood, and infrastructure needs to be more readily available before automation will be more broadly adopted. The initial testing of the smart siphon option is a first step in the direction of automation. It has demonstrated that it can be retrofitted to an existing siphon field and that it can be controlled in groups of siphons. The initial design was found to need some minor alterations and the installation process will need to be improved before it is more broadly adopted by industry.</p>

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Publications/ communication material	<ul style="list-style-type: none"> - System comparison brochure and poster showing the result from four years at Keytah. Brochure available at https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/keytah-system-comparison/GVIA-Comparison-Brochure-JULY-2016-low-res.pdf - System comparison video (not funded through this project) available on UBS or on-line. https://vimeo.com/174306570 - Completed system comparison technical trial report (submitted 30th June 2016) - Gwydir Valley 2016 Field Day booklet and event media - Gwydir Valley 2017 Field Day Booklet and event video; https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/
Acknowledgement	<ul style="list-style-type: none"> - The support and management from the grower partners was essential in this project; Sundown Pastoral Company, Auscott Limited and Australian Food and Fibre Limited. - Dr Joseph Foley, Dr Malcolm Gillies and Dr Alison McCarthy from the University of Southern Qld (USQ) and National Centre for Engineering in Agriculture (NCEA) provided support throughout the project. - Dr Janelle Montgomery provided support in her roles with the NSW Department of Primary Industry and CottonInfo.

Abbreviations and glossary

GVIA:	Gwydir Valley Irrigators Association Inc.
NCEA:	National Centre for Engineering in Agriculture
USQ:	University of Southern Queensland
CRDC:	Cotton Research and Development Corporation
Auscott:	Auscott Limited
AFF:	Australian Food and Fibre Ltd
GPWUI:	Gross Production Water Use Index (it combines total seasonal water use (irrigation and rainfall) with soil moisture and yield.
NSW DPI:	New South Wales Department of Primary Industry
CSIRO:	Commonwealth Scientific and Industrial Research Organisation

1 Project rationale and objectives

The Australian cotton industry is acutely aware of the fact that water is a limited and precious resource and that as an industry they need to constantly strive to utilise this resource as efficiently as possible. However, there is a lack of understanding of water use in agriculture by the general public, there is significant pressure for irrigated cotton producers to improve both their water use efficiency and profitability. During times of low water availability this pressure is intensified. The RRDP 1606 GVIA project is a grower-led initiative delivering commercially relevant data on the water use efficiency of various cotton irrigation systems.

Prior to the initiation of the RRDP 1606 project, the Keytah system comparison trial had a total of three sets of data; 2009-2010, 2011-2012 and 2013-2014. The collection of a fourth set of data provides growers and the community with increased confidence in the results and supports progression towards optimised irrigation practice. A grower survey from 2012 confirmed that growers wanted a set of long term data to utilise in their decision making with regard irrigation system choices. This desire remains relevant with 85% of growers surveyed at the 2014 field day wanting the project to continue.

The GVIA project is focused on continued investigation of cotton irrigation systems, optimisation of irrigation and a consideration of the resources needed to maximise the productivity and profitability of these systems.

The priorities of growers vary by location and season. Where water is limited the focus on water use efficiency increases, while in more remote areas such as Walgett or Mungindi labour is a key driving factor in farming efficiencies and hence sustainability. Additionally, energy costs, availability of infrastructure or new technologies, skills to manage new systems and the financial position of the farm are important considerations which impact on profitability.

An important aspect of the project is that growers were able to collaborate with industry and research partners, including NSW DPI, CSIRO and NCEA. The trial was able to demonstrate new technologies with partners including Water Quip Moree (MACE), Goanna Telemetry Systems, Islex and Rubicon.

The project was made up of two parts; The 2015/2016 Keytah system comparison trial and the 2016/2017 trials which analysed of the relative water use efficiency of different row configurations under optimal irrigation and enabled an initial assessment of the potential fit of the Smart Siphon into cotton.

The primary objective for Part 1 (Keytah System Comparison) of the RRDP 1606 project was to provide growers commercially relevant data on alternative cotton irrigation systems including; furrow siphon, bankless channel, lateral move and sub surface drip. The project was to consider the water use efficiency and management of the different systems.

The system comparison trial and extension program focused on:

1. Improved grower understanding of design, operation and best management of alternative irrigation systems.
2. Increasing grower knowledge and understanding of the water, energy and labour resource requirements of alternative irrigation systems whilst optimising productivity.
3. Increasing awareness of irrigation performance and evaluation of irrigation systems.
4. Improving the capacity of growers to make informed infrastructure investment decisions.
5. Enhanced grower ownership of research by developing grower and industry partnerships.

The primary objective of Part 2 (Optimised Row Configuration) of the RRDP 1606 project was to investigate the relative yield potential of different row configurations under optimal irrigation. The trial was designed to provide irrigators a more detailed understanding of the potential of each of the different row configurations to produce under optimal water, so that irrigators can make informed decisions on planted area, crop rotations and water during times of limited water.

The optimisation trial focused on:

1. Investigation of water-use efficiency optimisation techniques of siphon irrigation under different row configurations.
2. Demonstration of best practice and optimisation techniques of siphon irrigation.
3. Evaluation in terms of water-use efficiency.
4. Increased understanding of the pros and cons associated with different row configurations under siphon irrigation.

In part 2 of the trial the GVIA was also able to install 100 smart siphons to determine if they could have a potential fit as the cotton industry investigates how to efficiently progress towards automation of irrigation.

Initially part 2 was intended as a second system comparison trial at an alternative site. Seasonal conditions and access to suitable sites meant that part 2 of the project was adjusted as detailed above.

The data collected in the trial and the interaction of cotton growers at field events has enhanced the understanding of the drivers for change in the cotton industry. Helping growers manage the resources of water, energy and labour, will help to increase profitability, resulting in a more resilient and competitive cotton farming system and a more environmentally sustainable cotton industry.

During the project the additional objective to improve dissemination of trial information was added. This was made possible through support for an upgrade to the GVIA digital marketing platform. The upgrade was to allow for a more streamlined dissemination of trial information on several different media platforms. Additionally, it has allowed more detailed and targeted information transfer to growers.

Background:

The GVIA in partnership with Sundown Pastoral Company initiated a grower led irrigation project in 2008, initially funded from 2008-2012 under the Raising National Water Standards Program

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by the National Water Commission. Additional funding from the CRDC enabled the project to continue from 2012-2015.

The system comparison trial has continually added to grower's capacity, knowledge and understanding of the alternative irrigation systems. Many growers have altered their irrigation systems following a visit to Keytah or from discussions with people involved in the project, 50% of growers attending the 2014 Keytah field day indicating they intended to adopt changes to their operations using information from the project. The extension of the grower-led trials under RRDP 1606 complemented existing data and has enabled extensive collaboration with industry and research partners.

2 Method and project locations

The project included two parts run over two seasons:

1. 2015/2016: Keytah system comparison trial for sub surface drip, lateral move, furrow siphon and bankless channel, and
2. 2016/2017: Initially intended as a second system comparison trial at an alternative site. Seasonal conditions and access to suitable sites meant that Part 2 of the project was adjusted. The adjustment saw an analysis of the relative water use efficiency of different row configurations under optimal irrigation and an initial assessment of the potential fit of the Smart Siphon into cotton.

Although there are two separate trials over two seasons, similar methodologies were utilised at each trial to measure, monitor and communicate the results and benefits of each of the trials.

Methodology:

- Establish a project steering committee to over-see the grower-led approach and technical aspects of both parts of the trial;
- Assess soil moisture prior to planting and post picking using an EM38 and Soil cores;
- Utilise capacitance probes to monitor soil moisture during the season. Install head ditch and tail-drain water meters, and where possible storage meters to collect raw water-use data;
- Utilise other forms of water-use efficiency assessments;
- Record the volume of water applied and the rainfall throughout the season;
- Develop an understanding of labour and energy costs for the systems;
- Collect yield and water use for each of the treatments. Analyse the results between the different systems; drip, lateral, siphon and bankless, and across the different water-use-efficiency techniques, and incorporate with data collected in previous trials;
- Evaluate the resource requirements and management considerations for each of the systems; and
- Collect feedback from growers at field days, presentations and at industry events to demonstrate the project's ability to achieve outcomes.
- Develop a tailored communication strategy including;
 - the timing of field days or workshops including conferences;
 - opportunities to deliver results to the industry;
 - social media and internet promotion activities;
 - update promotional information packs with new results and new flyers;

Locations

Part 1: The system Comparison site was at Keytah 45km west of Moree.

Part 2: a) The optimised row configuration trial was located at Auscott Midkin 30Km north west of Moree.

b) The initial investigation of the Smart Siphon was at Red Mill 25Km north of Moree.

The data collected in the RRDP 1606 project is relevant for the whole Australian cotton industry and provides some insight for other industries such as sugarcane. The best fit will be in the central cotton regions of north west NSW and southern Qld, especially in areas where vertisol soils are present. In situations where soils are hard clay, more loamy or sandy additional localised data collection would be beneficial to further support grower investment decisions. For example, soils in the Trangie region of NSW are red clays prone to compaction; such soils may be suited to different row configurations or irrigation systems to those suited to vertisols. In addition, areas where there is high reliability of irrigation water will be more easily able to justify investment in systems such as lateral move or sub-surface drip which have significantly higher capital setup costs than siphon or bankless channel.

Another project RRDP1703 will report results for 2017 -18 season.

3 Project achievements

More detailed trial results are available in brochures and technical reports included in the appendix or on the Gwydir Valley Irrigators Association website.

<https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/>

Summary of Irrigation System Comparison Results:

Key Results

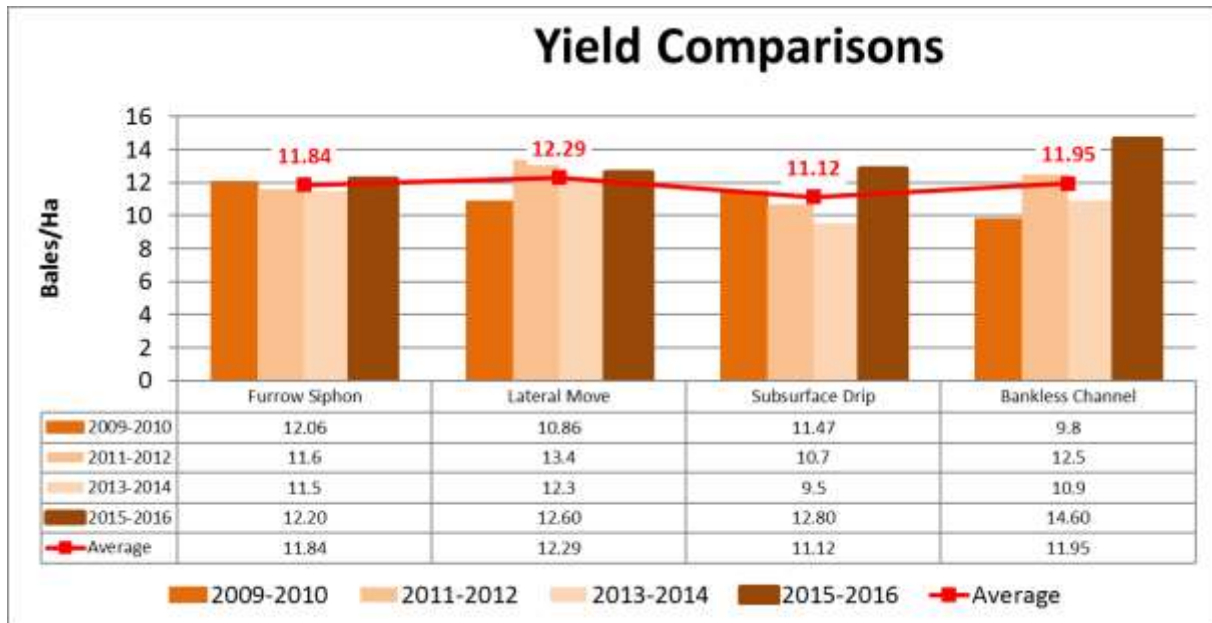
The key message is that the data clearly shows variations between seasons. There is no single system suited to all seasons or regions.

- The Lateral Move produced the highest average yield of 12.29 bales/Ha and GPWUI of 1.3.
- The Furrow Siphon was the most consistent yielding system with an average of 11.84 bales/Ha.
- The Bankless Channel had an average yield of 11.95 bales/Ha.
- The Drip had an average yield of 11.12 bales/Ha.
- The Furrow Siphon has high labour costs, but low operating energy costs.
- The Lateral Move and Subsurface Drip have high operating energy costs.
- The Lateral Move and Subsurface Drip have high capital costs.
- The Bankless Channel had the lowest total operating cost and the lowest operating, maintenance and ownership costs.

Figure 1 shows cotton yield data for the four years of the trial. When averaged over four years the lateral move system had the highest average yield. It is however important to note that there were significant plant establishment issues with the bankless channel in the 2009-2010 season which resulted in a significantly lower yield than expected.

Despite running out of water in the 2015-2016 season all systems produced their highest yield for the four years. The system with the most consistent yield over the four years has been the furrow siphon system, although it appears to have been more impacted by the lack of a final irrigation in 2015-2016.

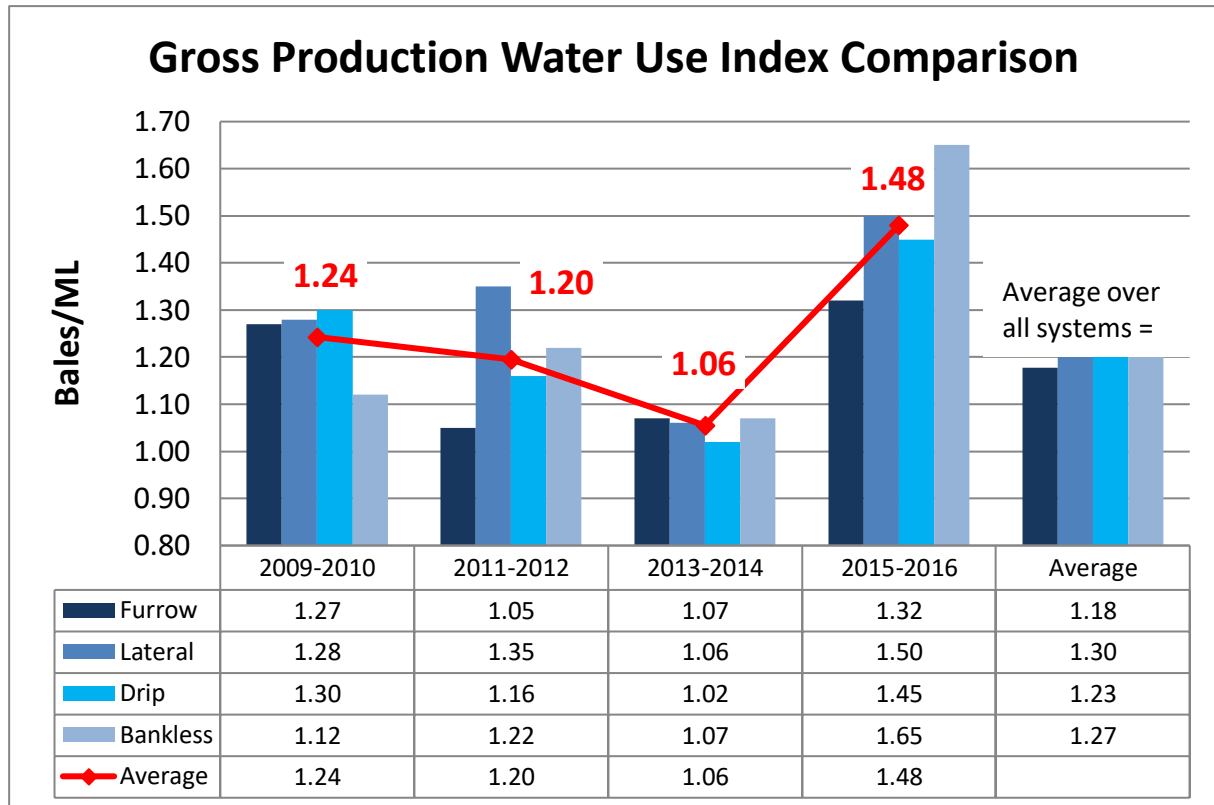
Figure 1: System Comparison Yield Comparisons 2009-2016



The variation in yield during the trial was less than the variation seen in water use efficiency or GPWUI between seasons. The Gross Production Water Use Index (GPWUI) was used to enable a comparison of the systems across years and across farms. It combines total seasonal water use (irrigation water and rainfall) with soil moisture and yield. The higher the GPWUI the more water efficient the crop.

Figure 2 shows the GPWUI over the four years of the trial. It demonstrates that each season has been different. This may be a result of the variable climatic conditions in each season. The 2009-2010 season was a typical season, while 2011-2012 was very wet and cloudy with two flood events. 2013-2014 was a warm to hot season with almost no rainfall and the final year irrigation ceased in February due to a lack of irrigation water. There was no rainfall for the last three months of the season.

Figure 2: Gross Production Water Use Index Comparison 2009-2016



Summary of the Optimised Row Configuration Results:

Figures 3 and 4 combine the yield of all row configurations and the irrigation water use efficiency from the four trial sites, over three seasons, relative to the industry standard row spacing 40inch.

Figure 3 shows that on average the yield from 30inch row spacing is 97% of the 40inch; this includes the 2014 -2015 replanted plots at Auscott. The 60inch yielded on average 18 percent less than the 40inch, while the 80inch yielded an average of 33 percent less than the 40inch.

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Figure 3: Yield Comparison relative to 40inch 2015-2017

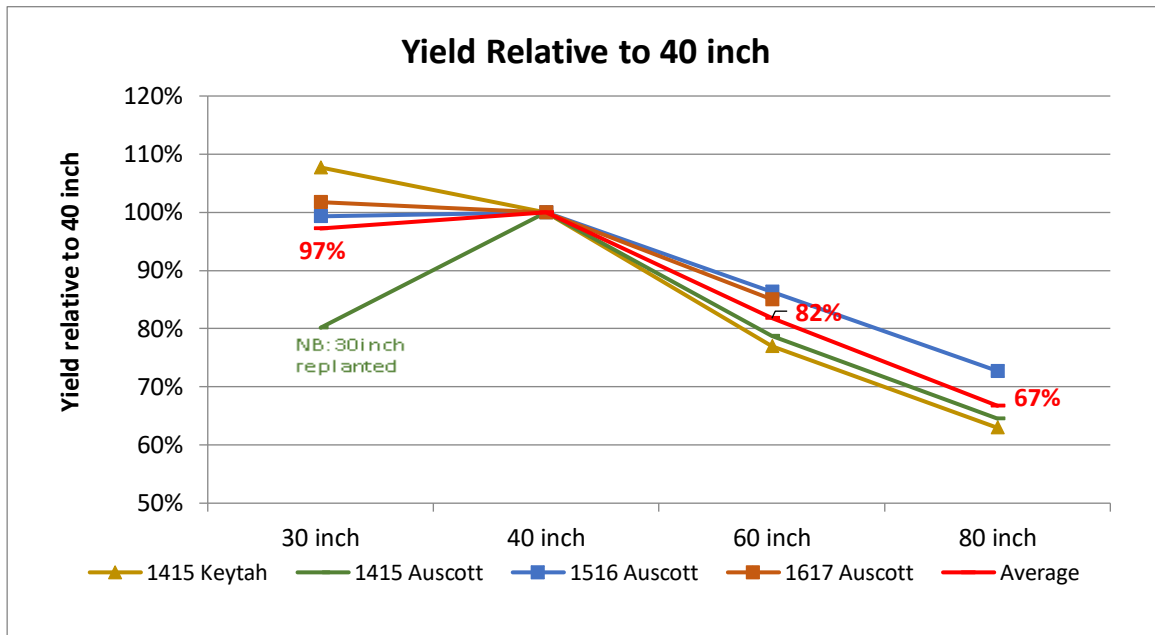
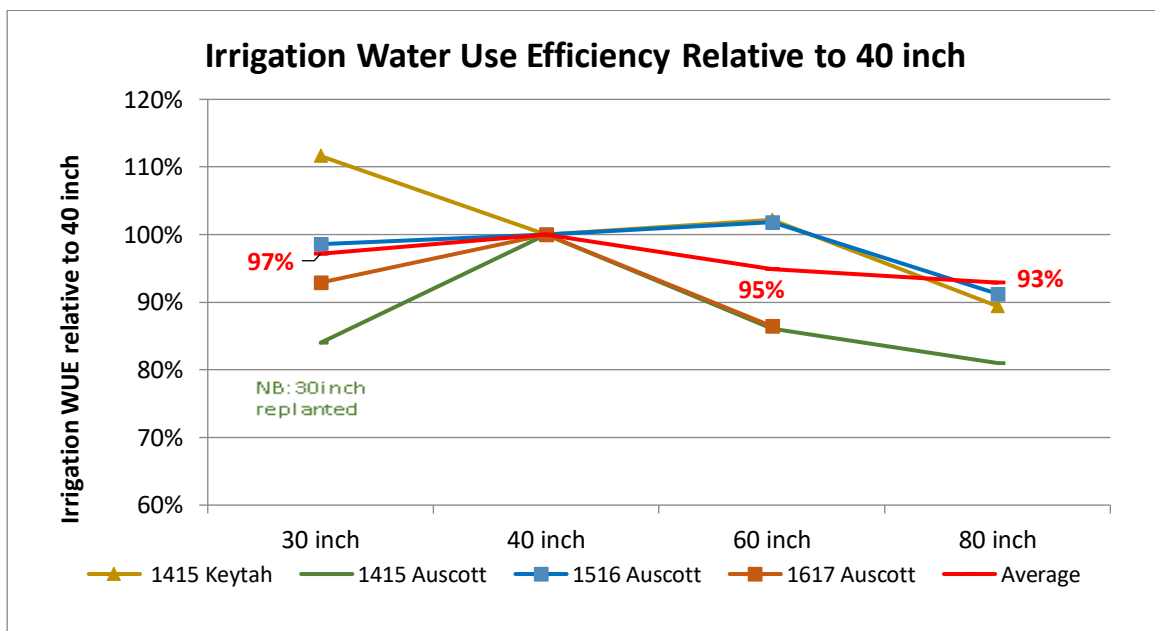


Figure 4 shows that the 30, 60 and 80inch row spacing plots used three, five and seven percent less water relative to the 40inch spacing.

Figure 4: Irrigation Water Use Efficiency Relative to 40inch 2015-2017



3.1 Project level achievements

KPI description	Activities	Outputs
Objective 1: Improve grower understanding of design, operation and commercial practicalities of different irrigation systems;		
1.1 Initiate and manage irrigation system comparison at Keytah	Held project steering committee meetings. Project field activities completed.	Provide independent, grower driven information Collect holistic water information. Monitor seasonal labour requirements and energy use in each system 2016 Field day 12th February with 110 growers and industry representatives present, hosted in partnership with CottonInfo.
1.2: Initiate and manage supplementary system comparison trial at different location(s) Milestone adjusted December 2016	Auscott row configuration trial planted to measure the maximum yield potential of three different row configurations. Trial and reporting completed. Red Mill field comparison of potential siphon automation options.	Commercial production outputs of WUE and yield assessed in optimised siphon comparison trials to provide growers improved understanding of potential of the different row configurations. Brochure updated in 2017 and disseminated in print and on-line. Demonstration of different siphon automation options completed at Red Mill. 2017 field day visited both sites providing the 130 participants the opportunity to see both trials in situ.
1.3: Develop and Implement a communication strategy to increase grower understanding and knowledge of the trial	Communication Plan developed and implemented; Presentation at Gwydir Valley Cotton Growers Association (CGA) Research Forum 8th October 2015 (20 present) 2016 Field day 12th February (110 present) in partnership with CottonInfo, Pre and post Field day media completed, Field day booklet distributed on day, Completed field day survey Attended Smarter Irrigation Automation Field day on 2nd March 2016. Keytah System Comparison Trial referenced and past brochures distributed.	Grower and Consultant understanding improved; 20 growers and consultants attended Gwydir Valley CGA research forum. 110 growers and consultants attending 2016 Field day. 2016 Field Day survey results: <ul style="list-style-type: none"> - Industry is most interested in bankless channel. - Importance in irrigation investment decisions were ranked as follows; Very Important: 94% water, 94% Yield, 81% R&M, 69% Capital investment, 63% Labour (time) and 56% Labour (skills)

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	<p>Presentation and Keytah site visit with TAS students 29th and 30th March 2016</p> <p>Hosted the Cotton Rural leaders (16) at Keytah in June 2016</p> <p>Hosted a group of twelve cotton growers from Dalby at Auscott and Keytah in July 2016</p> <p>Attended the 2016 Australian Cotton Conference, had a trade display showcasing research projects and presented two three minute theses on the project.</p> <p>Produced a system comparison brochure and poster showing the result from four years at Keytah.</p> <p>Developed system comparison video (partially funded through this project)</p> <p>Launched video at conference and distributed on UBS and on facebook</p> <p>Completed system comparison trial report</p> <p>Field day held on 8th February 2017, 130 attended, including 23 from north Qld and 18 from southern NSW.</p> <p>Promotion of field day in local print media, on line and in social media.</p> <p>Field day booklet distributed on line and at the event. The booklet was provided to Cotton Australia (Bec Fing) to use in the 'online training package for irrigation basics'</p> <p>Field day video prepared and available online.</p> <p>Field day survey developed and QR code distributed for electronic feedback.</p>	<p>Important: 6% Water, 6% Yield, 44% Labour (skills), 31% Capital, 31% Labour (time) and 19% R&M.</p> <ul style="list-style-type: none"> - Labour is the primary driving factor in irrigation investment decisions. (weighted average) - Capital investment and Repairs and Maintenance were next most important. (Weighted average) - Information presented at the field day was seen by 88% of respondents as useful to help make informed irrigation decisions. - 100% of respondents felt field day increased understanding of design, operation and management of alternative systems. <p>The inclusion of the GVIA irrigation system comparison video on line and on USB has extended the reach to an estimated 5,000 people.</p> <p>On-farm Dalby grower visit resulted in extensive discussion and ongoing interaction between individuals. Many who attended have reviewed their initial plans regarding irrigation infrastructure investment.</p> <p>GVIA actively participates in Irrigation industry forums and events.</p> <p>Next Generation of Agricultural scientists have been introduced to practical field applied research through presentation and visit to site.</p> <p>Utilise project data to develop commercially relevant comparison.</p> <p>2017 GVIA field day extended the reach of grower-led irrigation research to sugarcane producers from north Qld and to broadacre and horticultural producers from southern NSW. Investment in irrigation technology has taken place as a result of the GVIA field day (Sugarcane producers)</p> <p>Field day attendees heard grower presentations on their experiences of automation in sugarcane and at Waverley, the USQ Smarter Irrigation for Profit cotton site.</p>
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	<p>Attended the 2017 Smarter Irrigation for Profit annual meeting in March 2017. Provided a project summary to the audience.</p> <p>Attended the Water use in Agriculture RD&E strategy meeting in March 2017.</p> <p>Prepared a submission to the House of Representative Standing Committee on Agriculture and Water Resources – Inquiry into Water Use Efficiency in Australian Agriculture. Hosted members of the committee at Keytah on 6th April 2017 prior to appearing at the public hearing. System Comparison video was seen by committee members at the completion of the Keytah tour.</p> <p>GVIA digital marketing system totally revamped and the new system now incorporates videos, posts, detailed information and social media. It includes an irrigation research contact data base to use to support communication of research findings.</p>	<p>Survey results suggest that irrigators are looking at alternative row configurations (67%), that many believe compaction is an issue (83%), but that only 37% use true control traffic farming.</p> <p>2017 Survey data provided an insight into the existing adoption of irrigation technology, 63% used in-field soil sensors, 12% channel water level sensors and 20% Irrisat.</p> <p>Many growers were interested in adopting technology, 14% the Smart siphon, 19% channel water level sensors, 24% in-field soil sensors and 36% Irrisat.</p> <p>The level of understanding of automated or remote control irrigation and fully autonomous irrigation increased as a result of the field day.</p> <p>There has been increased adoption of remote control in the siphon irrigation field. Smart siphons have been installed at Keytah and Auscott in the Gwydir, as well as at a number of other sites in the Darling Downs and the Namoi.</p> <p>The smart siphon has undergone several changes following the 2016-17 trials. There is interest in automation of Smart Siphons.</p> <p>The importance and outcomes from government investment in irrigation research was communicated to the House of Representative Standing Committee on Agriculture and Water Resources. Members have an increased understanding of the critical role this kind of research plays for regional Australia.</p>
Objective2: Increase grower understanding and knowledge of the resource requirements for the alternative irrigation systems		
2.1: Develop comparative results for major resource inputs for each of the irrigation system.	<p>Field Activities completed</p> <p>Field Day presentation included data from previous comparisons. Discussion on labour, energy and water were included at the field day.</p>	<p>At 2016 field day 110 growers and consultants increased understanding of resource requirements.</p> <p>Grower capacity to make informed infrastructure investment decisions improved through attendance at field day.</p>

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2.2: Increase capacity of growers to make informed infrastructure investment decisions.	<p>Data on resource inputs updated and distributed to industry in August 2016.</p> <p>Dalby grower farm visit in July 2016 resulted in extensive on-going discussion which included the resource inputs of water, energy and labour as well as the capital investment considerations. These discussions also included talk of the importance of topography and what growers need to know before making system investment decisions.</p>	<p>Field Day survey results:</p> <ul style="list-style-type: none"> - Importance in irrigation investment decisions were ranked as follows; - Very Important: 94% water, 63% Labour (time) and 56% Labour (skills) - Important: 6% Water, 44% Labour (skills), 31% Labour (time). - 100% increased knowledge of water, energy and labour resources for alternative irrigation systems from field day. - Labour (time and skills) was identified as a high priority in irrigation investment decisions (weighted average) - Water, energy and labour are all considered in grower assessments of irrigation infrastructure investment.
Objective 3: Increase awareness of irrigation performance and evaluation of irrigation systems.		
3.1: Demonstrate methods to assess irrigation performance for both trials	<p>All water on and off for each of the systems at Keytah in 2015-2016 was assessed using Mace meters. Soil cores were used to determine soil moisture content and calculate GPWUI. Yield for each system was assessed by actual production.</p> <p>Mace meters and modified tail water structures were installed at Auscott to measure all water on and off each row configuration.</p> <p>Inclusion of channel water level sensors and Variwise technology at Red Mill provided more information in the evaluation of irrigation performance.</p>	<p>Monitoring of yield and water use efficiency completed at Keytah and Auscott. All results presented in brochures and technical reports.</p> <p>Inclusion of new technology at Red Mill provided an opportunity to demonstrate additional methods to assess irrigation performance.</p>

Objective 4: Increase grower ownership of research by developing grower and industry partnerships.		
<p>4.1 Establish steering committee</p> <p>4.2 Develop and enhance partnerships for delivery</p> <p>4.3 Establish multiple trial sites</p>	<p>Project steering Committee included industry representatives; Jane Trindal (CRDC), Joe Foley (USQ), Janelle Montgomery (NSW DPI) and the four grower representatives.</p> <p>Developed and enhanced partnerships for delivery through participation at industry events. Supported attendance at industry events with dissemination of data to industry through the GVIA website. Dissemination includes project pages with links to brochures, reports and videos, social media (twitter and Facebook), posts and emails.</p> <p>Steering Committee meeting 26th October 2016</p> <p>Primary focus was enhancing the 2016-2017 project to include field assessment of optimised siphon irrigation and the potential for automation.</p>	<p>GVIA participation in irrigation industry events;</p> <p>GVIA Irrigation Field Day (110 people) conducted in conjunction with the CottonInfo Nutrition Tour for 2016.</p> <p>Smarter Irrigation for Profit Automated Irrigation field day 2nd March 2016</p> <p>National Water Use in Agriculture RD&E Strategy Meeting 7th April and Field Day 8th April 2016.</p> <p>Smarter Irrigation for Profit Meeting 7th & 8th April 2016</p> <p>GVIA had a stand at the 2016 Australian Cotton Conference.</p> <p>GVIA presented two three-minute thesis on the Smarter Irrigation for profit project.</p> <p>2017 GVIA field day (130 attendees) extended the reach of grower led irrigation research to sugarcane producers from north Qld (23) and to broadacre and horticultural producers from southern NSW (18).</p> <p>Attended the 2017 Smarter Irrigation for Profit meeting in March 2017.</p> <p>Attended the Water use in Agriculture RD&E strategy meeting in March 2017.</p> <p>Investment in irrigation technology has resulted following the GVIA field day (Sugarcane producers investment in soil sensors)</p> <p>Field day attendees heard from and learnt from grower experiences of automation in sugarcane and at Waverley.</p> <p>Survey results as detailed in objectives 1,2 and 3 provide insight into grower perspectives on irrigation.</p> <p>The level of understanding of automated or remote control irrigation and fully autonomous irrigation increased as a result of the field day.</p>

Grower-led irrigation system comparison in the Gwydir

		Investigation of optimised siphon irrigation and automation has develop new partnerships and resulted in multiple sites being established. Stronger partnerships were developed with technology suppliers including Islex (smart siphon), Rubicon (water level sensors and gates) and USQ (research team)
Objective 5: To meet overall project commitments.		
<p>6.1: Contribute to the Smarter Irrigation extension plan</p> <p>6.2: Contribute data to the Smarter Irrigation M&E plan</p>	<p>Data collated in Keytah System comparison trial is readily available in the promotional material in print and electronically.</p> <p>Information collected during the 2016-2017 season has been distributed to industry and the smarter irrigation group.</p> <p>March 2017 attended the Smarter Irrigation for Profit meeting and field tour. March 2017 attended the Water use in Agriculture RD&E strategy meeting</p> <p>March 2017 prepared submission to the House of Representative Standing Committee on Agriculture and Water Resources – Inquiry into Water Use Efficiency in Australian Agriculture.</p> <p>Hosted members of the committee at Keytah on 6th April 2017 prior to appearing at the public hearing. System Comparison video was seen by committee members at the completion of the Keytah tour.</p>	<p>GVIA has actively contributed to the extension of commercial irrigation information through the implementation of the GVIA communication plan.</p> <p>GVIA has proactively worked to encourage the continued investment in irrigation research and extension by the federal government. GVIA submission is available on the House of Representative Standing Committee on Agriculture and Water Resources – Inquiry into Water Use Efficiency in Australian Agriculture web page.</p>
Objective 6: Upgrade the digital marketing system for the GVIA to enable effective dissemination of research outcomes to target customers		
	The GVIA have started a Facebook page linked to the GVIA Twitter account. This has enhanced the dissemination of project information.	An upgrade to the digital marketing system for the GVIA would allow the organisation to;

Grower-led irrigation system comparison in the Gwydir

	<p>https://www.facebook.com/GwydirValley/ https://twitter.com/GWYDIRVALLEY</p> <p>A new digital marketing system has been selected, the site map and design have been completed and the content has been completely reviewed and replaced.</p> <p>The full integration of information has been completed. https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/</p>	<p>Developed a new website incorporating blogs, posts and news feeds,</p> <p>Developed a functional database which utilises database grouping and optimisation tools to enable effective targeted interaction with the irrigation industry,</p> <p>More effectively disseminate information and the collection statistic data.</p>
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3.2 Contribution to programme objectives

The objective of the programme is to realise significant productivity and profitability improvements for primary producers, through:

- **generating knowledge, technologies, products or processes that benefit primary producers**

Every aspect of RRDP 1606 is designed to benefit primary producers, the principle focus is on irrigated cotton production. The RRDP 1606 project was designed by cotton producers in the Gwydir Valley to specifically address issues in farming systems.

It is a demonstration project specifically targeting efficiency in irrigation and optimised resource utilisation. The project has developed a comprehensive set of commercially relevant information on irrigation systems, tools and techniques. The data collection was specifically designed to help growers in their irrigation infrastructure decision making and to ensure that any new techniques or technologies meet their requirements of maintaining (or improving) productivity and profitability. Making more informed decisions will also help to reduce the likelihood of failure or poor setup of new systems, techniques or technologies if adopted and therefore, will contribute to long-term profitability.

There is increasing pressure on water use in the irrigation industry. This project is generating relevant commercial information that demonstrates the focus of industry on efficient resource utilisation. Information collected will help irrigators remain viable and productive and to adopt techniques or technologies with the best fit to their specific requirements. This trial program provides the opportunity to assess the performance of different systems across different seasonal conditions and assess the full suite of drivers that may influence decision making.

- **strengthening pathways to extend the results of rural R&D, including understanding the barriers to adoption**

The GVIA's research program has been developed by growers for growers and this is a key opportunity and point of difference giving growers ownership. By developing the project in this manner, the needs of the industry and the community are inherently embedded within the core objectives and outcomes of the project.

RRDP 1606 was a demonstration project designed specifically so that growers, consultants and industry people could make commercial comparison. A major component of the project was field days and site visits. Seeing different systems or new technologies used in commercial conditions is the best way to strengthen the pathways for adoption and to broaden the extension of findings. Each of the GVIA field days in the project were attended by over 100 people. Event feedback provided greater understanding of the drivers for irrigation investment decisions:

- Importance in irrigation investment decisions were ranked as follows;
 - Very Important: 94% water, 63% Labour (time) and 56% Labour (skills)
 - Important: 6% Water, 44% Labour (skills), 31% Labour (time).
- 100% increased knowledge of water, energy and labour resources for alternative irrigation systems from field day.

Grower-led irrigation system comparison in the Gwydir

- Labour (time and skills) was identified as a high priority in irrigation investment decisions (weighted average).
- Water, energy and labour are all considered in grower assessments of irrigation infrastructure investment.

The broader analysis of energy, labour and maintenance costs has resonated with growers as individuals have different factors that are driving their desire for change.

- **establishing and fostering industry and research collaborations that form the basis for ongoing innovation and growth of Australian agriculture.**

The support from within the region and beyond, reinforces that the grower led ethos of the GVIA is relevant for growers everywhere and highlights that there is broader industry desire for greater awareness of the efficiencies and opportunities of alternative irrigation systems for cotton growing.

This project provided a two way process of communication: initiated by growers, the project provides information which is timely, relevant and targeted to grower needs. In addition, key irrigation researchers and suppliers are provided direct access to trial partners and to the large number of growers who attend the GVIA field days annually.

Of key importance was the interaction of irrigators from the Burdekin in Qld and southern NSW at the 2017 GVIA field day. Presentations of advances in automation in the sugar industry and at Waverley in the Namoi (USQ Smarter Irrigation for Profit site) demonstrate the value of collaboration at a grower demonstration and a research level.

The GVIA worked closely with researchers from the University of Southern Qld, and NCEA as well as with industry through the NSW DPI and CottonInfo. Combining to extend findings in joint field events provides diversity in information flow and helps extend research findings to a broader audience.

Explain how the project achievements, if applied by primary producers, would improve the productivity and/or profitability of businesses and/or primary industries. Include a quantitative estimate where possible.

The project has a focus on driving optimum resource efficiencies as cotton production is facing challenges from competition for land, water and labour. This nexus is challenging individual growers, who are struggling to understand where to focus their resources to maintain their productivity and profitability best. The project was designed to maintain or improve production whilst using other resources efficiently, focusing on water-use efficiency but recording and reporting on energy and labour as well, all factors which contribute to grower profitability. The full suite of factors is required to provide growers with the complete picture and it is this holistic approach that has gained the most interest from growers (discussion at 2014 Field Day).

The information has improved the capacity and knowledge of factors like energy and water efficiency that can influence the long-term sustainability of the industry. The project demonstrated that there is no optimal irrigation system. There was notable variation in yield and GPWUI for each of the systems between years. Data suggests that lateral move systems will produce both high yield and GPWUI, but that seasonal conditions will significantly influence the outcomes from this irrigation system. In seasons where conditions are hot and rainfall low there

Grower-led irrigation system comparison in the Gwydir

will be very little or no benefit from a lateral move system, however in a wet overcast season it will provide more control and benefits.

The trial has also highlighted the demands for energy and labour of the different irrigation systems. Pressurised systems such as lateral move and drip have significantly higher energy requirements and cost associated with capital setup and seasonal operations. Siphon systems have high labour requirements, something that may be able to be addressed through automation, while the bankless channel system is the most efficiency from both labour and energy perspectives.

The project provides detail on the potential fit of each of the irrigation systems which means growers can make decisions best suited to their locations and needs. Consideration of soil, climate topography and water reliability are all critical in making irrigation infrastructure decisions. Where there is low reliability of irrigation water, such as in the Gwydir, investment in systems with high capital set up costs are unlikely as the return on investment would need to be spread over a longer time frame as a result of low water reliability.

4 Collaboration

Throughout the project the GVIA have worked closely with grower partners, researchers and industry representatives.

There have been three grower partners;

- Sundown Pastoral Company who own Keytah where the system comparison site is located. The staff at Keytah play an active role in the management of the trial and are of critical importance in disseminating the findings. They regularly host visitors and present at the GVIA field day. They have participated in video interviews which are utilised to disseminate the trial findings.
- Auscott Limited who own Midkin where the 2016-2017 row configuration site was located. The agronomy and irrigation staff played an active role in the setup of the site and in the management of the trial. They hosted part of the 2017 field day and presented on the trial at the field day and at the 2016 Australian Cotton Conference.
- Australian Food and Fibre Limited who own Red Mill participated in the infield assessment of the Smart Siphon. They helped with the installation of the siphons, the management of the site and presented a grower perspective at the 2017 field day

Research collaborations have been an extremely important part of the project. Dr Joseph Foley has provided ongoing technical support and advice throughout the project. Dr Malcolm Gillies and Dr Alison McCarthy have also been involved.

Industry collaboration with the NSW DPI and CottonInfo has further added to the project. Dr Janelle Montgomery has assisted with calculation of GPWUI and with the co-ordination of the joint GVIA, CottonInfo field day in 2016.

Collaboration with service providers was another area that was important to the success of the trial. The MACE meters utilised at both Keytah and Auscott were installed, calibrated and maintained by WaterQuip in Moree. Additionally, the C-Probes, weather stations and monitoring data collected in the trials was all sourced in real time on line through the Goanna Telemetry system. At the Red Mill site Rubicon provided support with a channel level sensor, a critical tool in automation of irrigation.

One of the most important collaborations was with irrigators from other regions. The 2017 field day provided an opportunity for a group of sugarcane growers from the Burdekin and a group of irrigators from southern NSW and Northern Vic. to see grower-led research in action. This collaboration involved a presentation on automation of irrigation in sugarcane from growers and members of the Smarter Irrigation for Profit Project in sugarcane, Dr Malcolm Gillies of USQ/NCEA and Steven Attard of AgriTech Solutions. As a result of the visit to irrigation sites in the Moree region there has been invigorated interest in irrigation monitoring tools and technologies in sugarcane.

All collaborations have been beneficial, and it is anticipated that they will continue into the future. Of particular importance has been the collaboration with the team at USQ. Their contribution has been invaluable on a technical level providing practical support in the implementation of cutting edge technology.

5 Extension and adoption activities

The GVIA field based extension activities were designed to give growers direct access to the trial sites, a technique that gives them increased understanding and appreciation of the factors associated with making irrigation investment decisions. Over 280 individuals have visited the GVIA Keytah, Auscott or Red Mill sites during the term of the RRDP 1606 project.

The principal is to increase grower understanding of the factors associated with irrigation system decisions. Increasing grower knowledge of capital setup costs, system maintenance, water use efficiency by system and season, system operational requirements and labour resourcing all combine to enhance the adoption of project outputs across industry.

Field and Event Activities

- 8th October 2015: Gwydir Valley Cotton Growers Association (CGA) Research Forum
Presentation on project objectives (20 present)
- 12th February 2016: GVIA Field day in partnership with CottonInfo (110 present)
Pre and post Field day print media
Field day booklet distributed on day
Completed field day survey
- 2nd March 2016: Attended Smarter Irrigation Automation Field day. Keytah System
Comparison Trial referenced, and past brochures distributed.
- 30th March 2016: Presentation and Keytah site visit with The Armidale School (TAS)
students
- June 2016: Hosted the Cotton Rural leaders (16) at Keytah
- July 2016: Hosted a group of twelve cotton growers from Dalby at Auscott and
Keytah.
Produced a system comparison brochure and poster showing the result
from four years at Keytah.
Developed system comparison video (partly funded through this project)
- August 2016: Attended the 2016 Australian Cotton Conference and had a trade display
showcasing research projects.
Presented a 3 minute thesis on both the system comparison and
optimised row configuration trials at 2016 conference.
Launched video at conference and distributed on UBS and on facebook.
- September 2016: Completed system comparison technical trial report.
- 8th February 2017: GVIA Field day, 130 attended, including 23 from north Qld and 18 from
southern NSW.
Promotion of field day in local print media, on line and in social media.
Field day booklet distributed on line and at the event.
Field day booklet provided to Cotton Australia (Bec Fing) to use in the
'online training package for irrigation basics'
Field day video prepared and available online.

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- 21st March 2017: Smarter Irrigation Project meeting Griffith.
- 20th July 2017: Attended Smarter Irrigation for Profit Round 2 cotton planning.
- September 2017: Completed row configuration trial technical report and undated brochure.
- 2017: Upgrade of the GVIA digital marketing platform. Review of project summaries and inclusion of detail associated with the project. Links to technical reports, brochures and videos associated with the project.

Printed and online or electronic material provide additional detail on the project findings. It also enables the information to be disseminated to a broader audience.

<https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/>

The project features prominently in posts and in videos, in addition to facebook and twitter.

Electronic Promotion 2016-2017

- GVIA Facebook
 - Field day listed as an event.
 - Posts around the field day reached over 600 people
 - Moree Champion article posted reached over 400 people
 - NFF blog reached 164 people
- GVIA Twitter
 - Five tweets on the 8th Feb 2017, (the day of the Field day) made 1438 impressions,
 - on the 9th Feb 2017 365 impressions and
 - on the 10th Feb 2017 787 impressions.
 - One of the tweets had a 12% engagement rate
 - There were 6 tweets on the field day for others

Gwydir Grower – Cotton Info Newsletter

Additional On-line Promotion

- 9th February 2017: <http://www.moreechampion.com.au/story/4457460/smarter-irrigation/?cs=1483>
- 10th February 2017: <http://www.farmers.org.au/content/nff/en/community/blog/chasing-water-use-efficiency-in-the-Northern-Basin-10022017.html>

Print Promotion

150 copies of field day booklet prepared and distributed. Electronic copies distributed to presenters and to Cotton Australia (Bec Fing) for use in on-line irrigation training packages.

Moree Champion: 2nd February 2017
9th February 2017 – Print and on-line

Border News: 22nd Feb 2016
23rd January 2017
14th February 2017

The Land:

Field Day survey results indicate the following;

At 2016 field day 110 growers and consultants increased understanding of resource requirements.

Grower capacity to make informed infrastructure investment decisions improved through attendance at field day.

2016 Survey responses

Q4: How important are the following parameters in your irrigation investment decisions?

	very important	Important	slightly important	not important
Capital investment	68.75%	31.25%	0.00%	0.00%
Repairs and Maintenance	81.25%	18.75%	0.00%	0.00%
Labour (time)	62.50%	31.25%	6.25%	0.00%
Labour (skills)	56.25%	43.75%	0.00%	0.00%
Water	93.75%	6.25%	0.00%	0.00%
Yield	93.75%	6.25%	0.00%	0.00%

Q5: Thinking about the Row Configuration trials;

	Yes	No
Was the information presented useful?	88.24%	11.76%
Are you interested in alternative row configurations?	81.25%	18.75%

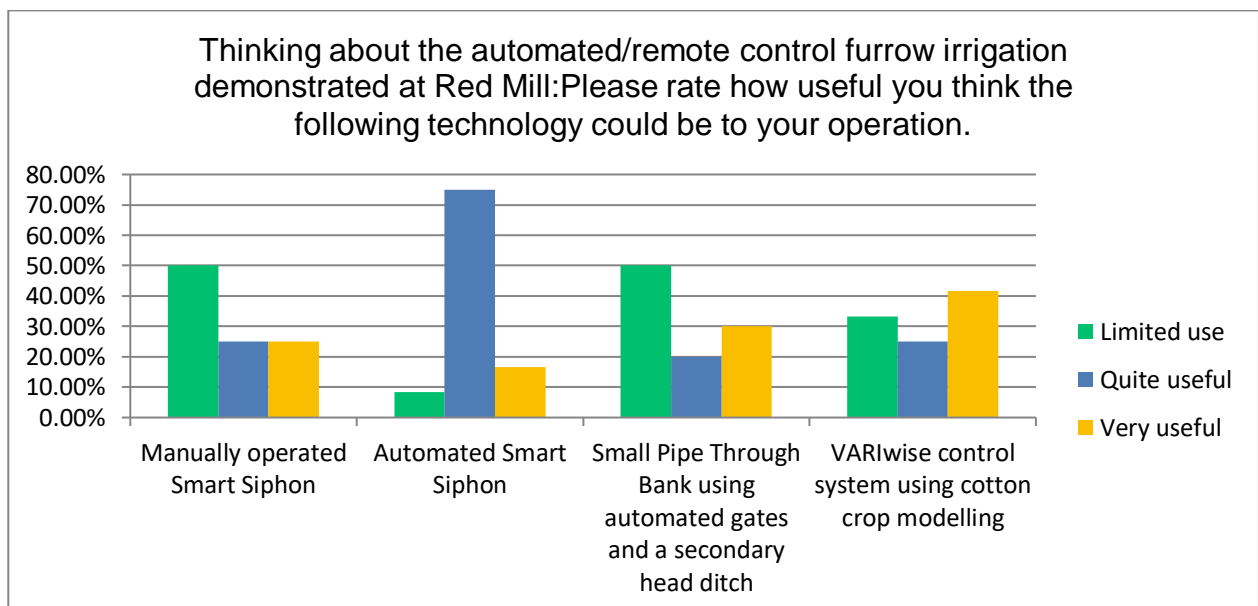
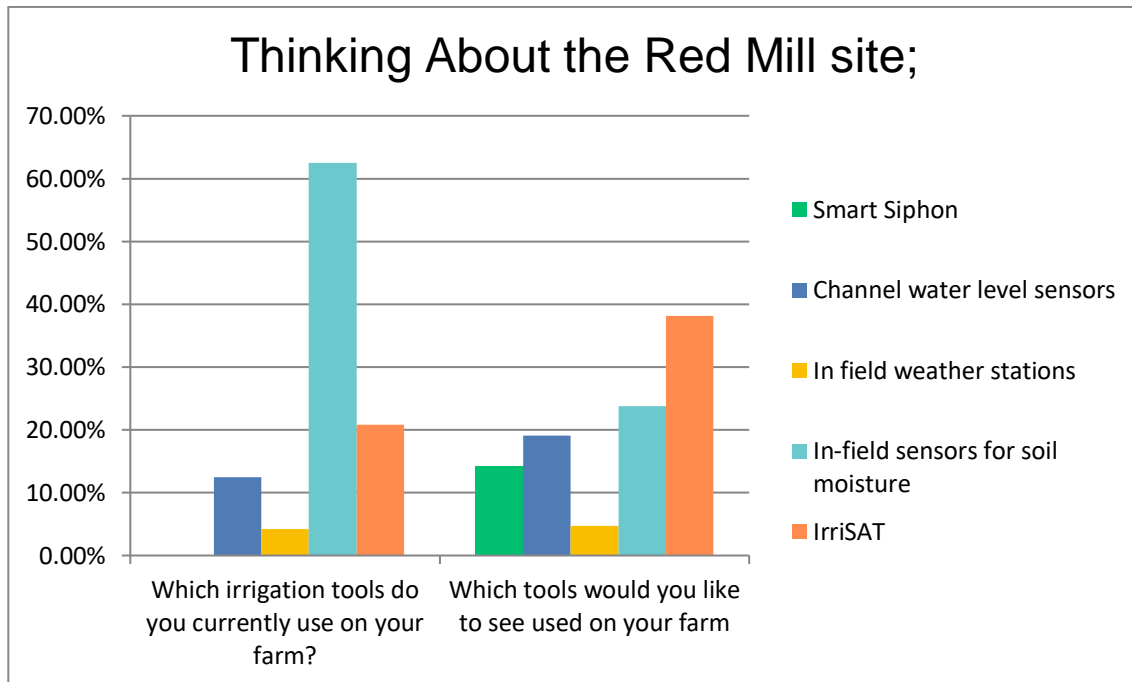
Q6: Thinking about the Keytah system comparison trial, have the brochure and the field day;

	Yes	No
Increased your understanding of design, operation and management of alternative irrigation systems?	100.00%	0.00%
Increased your knowledge of water, energy and labour resources for alternative irrigation systems?	100.00%	0.00%
Will the information be useful to help make informed irrigation decisions?	88.24%	11.76%

2017 Field Day Survey Responses

Q7: Thinking about the Auscott Row Configuration Trial;

	Yes	No
Would you like to see the trial continuing to collect more information?	100.00%	0.00%
Do you believe alternative row configurations could have a fit in your operation?	66.67%	33.33%
Do you believe compaction is an issue on your farm?	83.33%	6.67%
Do you utilise true control traffic farming?	36.67%	46.67%



6 Lessons learnt

The project has continued to demonstrate that growers need realistic commercial assessments of tools and technologies to enhance the potential for adoption. Survey responses show that irrigation investment decisions will be made based on a balanced assessment of all the drivers, not simply on the need of one driver such as water use efficiency.

Indications are that irrigation investment decisions will be carefully assessed, possibly taking several years.

In 2017 survey responses were sort using an electronic system. This proved to be significantly less successful than a written response. In general farmers do not like completing surveys of any sort despite the potential benefits that may stem from the findings.

The project has provided a broad range of media all of which have been found to be useful. The complete system comparison video (12 minutes) has been watched by growers interested in making changes. Distribution of this on line and on a USB have both been utilised. The field day booklets are always well received, as are the trial brochures and posters.

7 Appendix - additional project information

7.1 Project, media and communications material and intellectual property

Technical Report:	System Comparison 2016, Row Configuration 2017
Print:	2016 Row Configuration Brochure and Poster, 2016 System Comparison Brochure and Poster, 2017 Row Configuration Brochure, 2016 Field Day Booklet, 2017 Field day booklet,
Media:	Border News – 22 nd Feb2016, 23 rd Jan 2017, 13 th Jan 2017 Moree Champion – 9 th Feb 2017
Electronic:	NFF GVIA Field Day 10 th Feb 2017, https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/ https://vimeo.com/174306570 https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/keytah-system-comparison/ https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/optimised-irrigation-row-comparison/
Conference:	Trade display Three Minute thesis presentations 2016 Australian Cotton Conference

7.2 Equipment and assets

Item	Purchase Date	Purchase Value	Value 30June17
MACE Flo Series 3 – AgriFlo	21Oct15	\$7,443	\$6,699
HP Laptop	30June17	\$1,405	\$1,404

7.3 Monitoring and evaluation

Attach the final project evaluation report in line with the project Monitoring and Evaluation plan. This should report on the project's outcomes against the program objective and include quantitative and qualitative information on outcomes achieved and expected.

7.4 Budget

P&L for June 2016 and June 2017 included following.

Financial information from the 2017-2017 financial year will be made available in June 2018

GWYDIR VALLEY IRRIGATORS ASSOCIATION INC		
STATEMENT OF PROFIT AND LOSS - CRDC 1606		
FOR THE YEAR ENDED 30 JUNE 2016		
INCOME		
Project income		181,340
Project funds held - Opening balance		-
Project funds held - Closing balance		(26,553)
TOTAL INCOME		154,787
EXPENSES		
Capital items purchased		8,000
Communications		2,728
Depreciation		557
Evaluation and reporting		5
Field days		1,480
Meeting expenses		1,062
Motor vehicle expenses		74
Project management - Contractor		315
Repairs and maintenance		13,075
Regrade Keytah bankless field		7,600
Regrade Keytah trial laterals		54,400
R&M - Drip tape		7,152
Superannuation		4,584
Uniformity audit laterals		5,500
Wages - Employees		48,255
Transfer additional funds to members/ (Members contribution to project)		-
		154,787
OPERATING PROFIT/(LOSS) FOR THE YEAR		-

GWYDIR VALLEY IRRIGATORS ASSOCIATION INC	
STATEMENT OF PROFIT AND LOSS - CRDC 1606	
FOR THE YEAR ENDED 30 JUNE 2017	
INCOME	
Project income	107,100
Project funds held - Opening balance	26,553
Project funds held - Closing balance	(33,039)
	<u>100,614</u>
Interest received	135
TOTAL INCOME	<u>100,749</u>
EXPENSES	
Accountancy and audit	2,015
Bank charges	5
Field days	3,784
In-field project expenses	17,533
Meeting expenses	823
Project management - Contractor	4,462
Printing, stationery and postage	-
Promotional activities	12,568
Superannuation	4,338
Telephone	3,671
Travel and accommodation	4,483
Wages - Employees	45,662
Capitalised items purchased	1,405
	<u>100,749</u>
OPERATING PROFIT/(LOSS) FOR THE YEAR	<u>-</u>



CRDC1606 Technical Research Report
30th June 2016

Grower Led Irrigation System Comparison in The Gwydir Valley

Gwydir Valley Irrigators Association Inc
April 2018



Grantee:	Gwydir Valley Irrigators Association Inc.
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making every drop count

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Executive Summary

The 2015-2016 season was the fourth year where the Gwydir Valley Irrigator Association (GVIA) and Sundown Pastoral Company have managed the Keytah Irrigation System Comparison trial. This is a unique project which is run by growers with the specific intention to collect relevant commercial data. This data is designed to provide cotton growers greater insight into the four different systems under review.

During the project the Gross Production Water Use Index (GPWUI) was calculated for each of the systems. There has been quite a bit of variation in these figures over the four years. This suggests that the efficiency of the systems can be significantly impacted by other variables, most especially the climatic conditions. Each of the four seasons has been very different climatically, from cool and wet, to hot and dry, with one season where there was no irrigation or rainfall to finish the crop. The strongest performing system when compared using the GPWUI was the lateral move, while the siphon produced the lowest average index.

The four seasons of research have shown the lateral move to have the highest average yield and gross production water use index. The Furrow siphon has produced the most consistent yield. The bankless channel had the second highest average yield and the drip the lowest average yield.

The siphon field had significantly higher labour requirements, but along with the bankless channel it had very low operating energy costs. In contrast both the pressurised systems, the lateral and drip, had high operating energy costs. These two systems also had high capital setup costs. When compared on an operation and maintenance basis, the Bankless Channel had the lowest total operating costs and the lowest operating, maintenance and ownership costs. This coupled with favourable yield and GPWUI results makes it a strong contender in many situations. Bankless channel however, may not be practical in some regions because of the earth works required to develop fields.

The project has shown that although important, water alone is not the only driver growers must consider when making decisions on irrigation systems. The reliability and the potential yield achievable under each of the systems are key considerations for growers. They must also look at the consistency of performance, capital investment needed and the resources of labour and energy when looking at changing irrigation systems.

Background

The GVIA in partnership with Sundown Pastoral Company initiated a grower led irrigation project in 2008. It was initially funded from 2008-2012 under the Raising National Water Standards Program by the National Water Commission. Additional funding from the CRDC enabled the project to continue from 2012-2015.

At the start of this project, the Keytah system comparison trial had a total of three years of data; 2009-2010, 2011-2012 and 2013-2014. The addition of a fourth year of data has increased grower confidence in the data, enabling them to make more well informed investment decisions.

The trial has been well received by growers and industry since its inception. This data has continually added to grower's capacity, knowledge and understanding of the alternative irrigation systems, providing growers greater insight into the requirements and resource implications of alternative irrigation systems for cotton production.

Many growers have altered their irrigation systems following a visit to Keytah or from discussions with people involved in the project, fifty percent of growers attending the 2014 Keytah field day indicating they intended to adopt changes to their operations using information from the project. A grower survey from 2012 confirmed that growers wanted a set of long term data to utilise in their decision making with regard irrigation system choices. This desire remains relevant with 85 percent of growers surveyed at the 2014 field day wanting the project to continue.

As the Keytah trial is run every second season, the GVIA compliment it with additional trials focussing on optimising one of the four systems being compared. This helps to maintain momentum for the GVIA and growers, but also provides an opportunity for the project to be flexible in meeting grower needs. The additional trial under the RRDP 1606 project is the Optimised Row Configuration trial which was conducted in 2016-2017 at Auscott Midkin. Previous trials include; Telleraga Pipe-through-bank (2008), Redbank Row Configuration and Water Regime (2010-2011), the Row Configuration Optimisation (2014-2015).

The GVIA project is a grower-led initiative, focused on commercial reality. It will complement existing data and enable extensive collaboration with industry and research partners.

Methods

The project includes two trials to be run over two seasons:

1. 2015/2016: Keytah system comparison trial for sub surface drip, lateral move, furrow siphon and bankless channel, and
2. 2016/2017: Initially intended as a second system comparison trial at an alternative site. Seasonal conditions and access to suitable sites meant that Part 2 of the project was adjusted. The adjustment saw an analysis of the relative water use efficiency of different row configurations under optimal irrigation and an initial assessment of the potential fit of the Smart Siphon into cotton.

Although there are two separate trials over two seasons, similar methodologies were utilised at each trial to measure, monitor and communicate the results and benefits of each of the trials.

Methodology:

- Establish a project steering committee to over-see the grower-led approach and technical aspects of the trial;
- Assess soil moisture prior to planting and post picking using an EM38 and Soil cores;
- Utilise capacitance probes, head ditch and tail-water meters, and storage meters to collect raw water-use data;
- Utilise other forms of water-use efficiency assessments such as IrriSat;
- Record water applied and rainfall throughout the season;
- Maintain records of labour and energy costs for the systems;
- Collect yield results for each system.
- Analyse yield and water use results between the systems; drip, lateral, furrow and bankless, and incorporate into previous year's results;

- Evaluate the resource requirements and management considerations for each of the systems;
- Evaluate project's ability to achieve outcomes through surveys at field days, presentations and at industry events.
- Develop a tailored communication strategy including;
 - the timing of field days or workshops including conferences;
 - opportunities to deliver results to the industry;
 - social media and internet promotion activities;
 - update promotional information packs with new results and new flyers;

Results

The system comparison trial was completed in April 2016, with ginning during May 2016.

Soil Moisture

EM38 and soil cores were taken to assess the starting and finishing soil moisture levels. The soil cores were collected as per guidelines from QDPI. The intention was to use this data to calibrate the EM38. Unfortunately, it was not possible to calibrate the EM38, so only soil core information has been utilised.

Table 1: Soil Moisture 2015-2016

System	Pre-plant 0-80cm	Post-picking 0-80cm	Used Reserves
Siphon Furrow	214.2	229.8	-15.6
Lateral Move	259.6	150.8	108.8
Subsurface Drip	257.1	213.5	43.7
Bankless Channel	246.3	229.5	16.8

Crop Management

Table 2: Crop Management activities 2015-2016

Activity	Siphon Furrow	Lateral Move	Subsurface Drip	Bankless Channel
Soil core and EM38	19 th October 2015	19 th October 2015	19 th October 2015	19 th October 2015
Pre-Irrigation		8 th October 2015		
Variety	Sicot 74BRF			
Planting	20 th October 2015	20 th October 2015	20 th October 2015	19 th October 2015
Watered-up	23 rd October 2015	23 rd October 2015	23 rd October 2015	20 th October 2015
First Defoliation	24 th March 2016	29 th March 2016	29 th March 2016	29 th March 2016
Picking	13 th April 2016	19 th April 2016	19 th April 2016	18 th April 2016
Soil core and EM38	26 th April 2016	26 th April 2016	26 th April 2016	26 th April 2016

Irrigation Water

In 2015-2016 the lateral move received 60mm pre-irrigation. All other systems were watered up.

The last irrigation for all systems was in late February 2016. All systems would have benefited from the application of further irrigation water or in-crop rainfall, neither of which occurred.

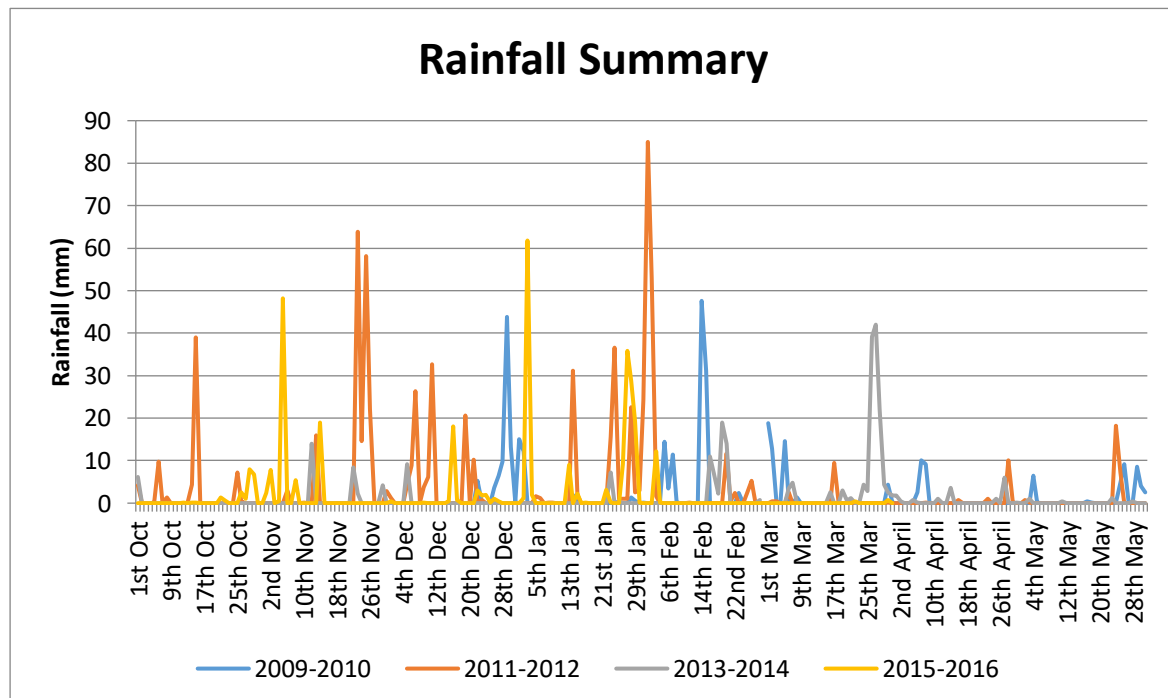
Table 3: Irrigation Water Applied 2015-2016

System	Date of Last Irrigation	Number of Irrigation	ML/ha
Siphon Furrow	19 th February 2016	6	6.91
Lateral Move	27 th February 2016	12 + 1 pre-irrigation	4.85
Subsurface Drip	23 rd February 2016	North 10	5.57
		South 11	5.58
Bankless Channel	21 st February 2016	5	6.06

Climatic Data

The trial has been run over four seasons each with noticeably different climatic conditions. 2009-2010 was a typical season - 2011-2012 was wet and overcast with two flood events, 2013-2014 was hot and dry with very little in crop rainfall, while in 2015-2016 the season was again quite typical, but there was not sufficient irrigation water to fully irrigate the trial.

Figure 1: Rainfall

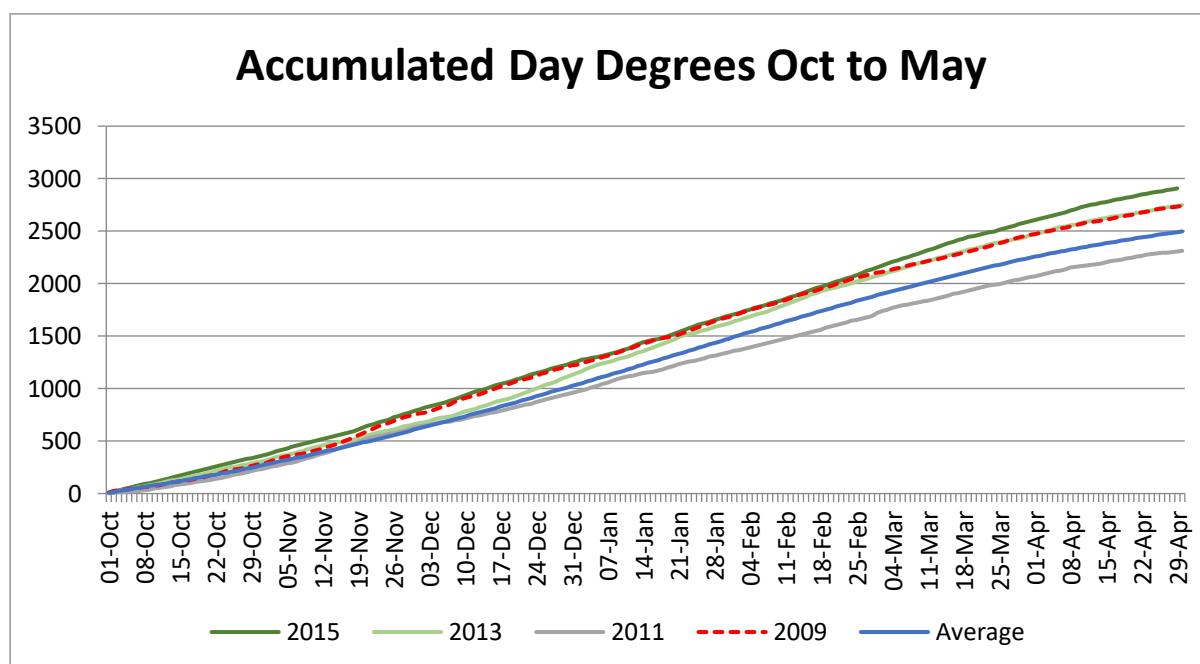


The trial site received a total of 319mm of rainfall from October 2015 to April 2016. The daily rainfall data (figure 1), indicates that there were only six effective rainfall events during the season where more than 10mm of rain was received (79% effective rainfall). There was no rainfall during March and April and no irrigation after February. The furrow siphon received its last irrigation on the 19th

February, the bankless channel on the 21st of February, the subsurface drip in the 23rd February and the lateral move on the 27th February as shown in table 3 above.

The lack of sufficient irrigation water and an accumulated day degree which was slightly above the long-term average as shown in figure 2 following, may have impacted the performance of each of the systems in the 2015 -2016 season.

Figure 2: Accumulative Day Degrees



Yield

The results for the 2015-2016 season are shown in figure 3 below. Despite receiving no irrigation or rainfall after mid-February the trial has yielded well. The strongest yield performer this season was the bankless channel.

The siphon field had the water cut off the earliest and as a result cut-out earlier than the other fields. It received its first defoliation on the 24th March 2016, the remainder of the trial was first defoliated on the 29th March 2016.

Picking in the siphon field started 19 days after first defoliation on the 13th of April, while the bankless was picked on the 18th of April (21 days after first defoliation) and the remaining fields picked on the 19th April (22 days after first defoliation).

Figure 3 below shows that the yield for the bankless channel in 2015-2016 was 14.6 bales/ha, noticeably higher than that for the other three systems, which ranged from 12.2 to 12.8 bales/ha. When compared on a bale per mega litre basis the lateral, bankless and the drip were all strong performers at 2.61, 2.41 and 2.30 bales per mega litre respectively.

Figure 3: Yield and Irrigation Water Use Efficiency 2015-2016

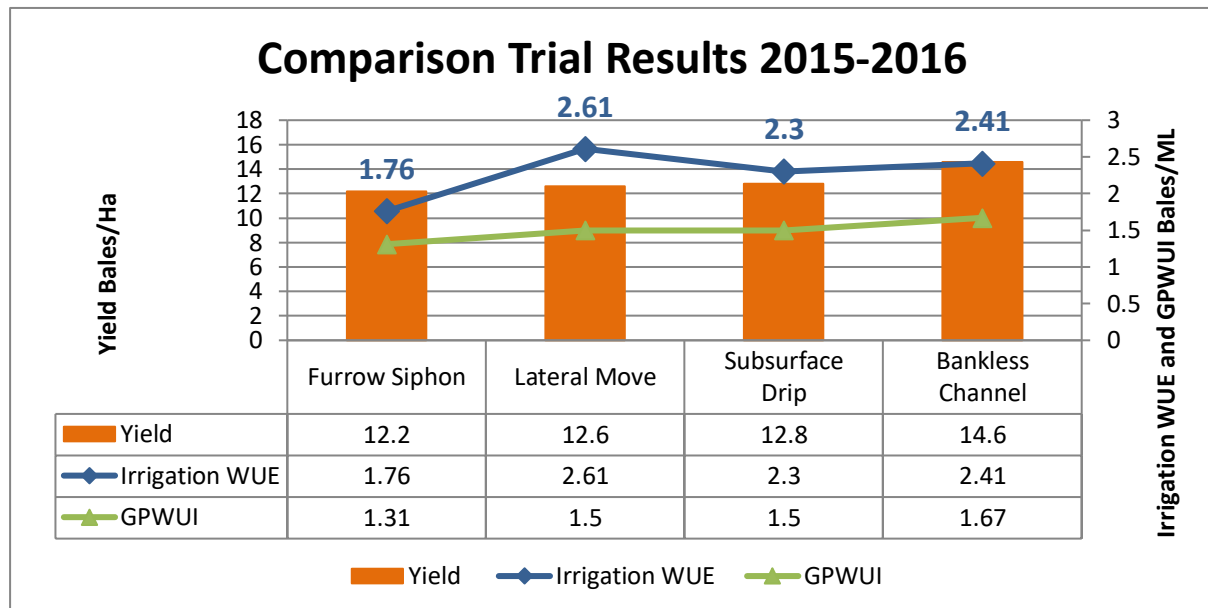
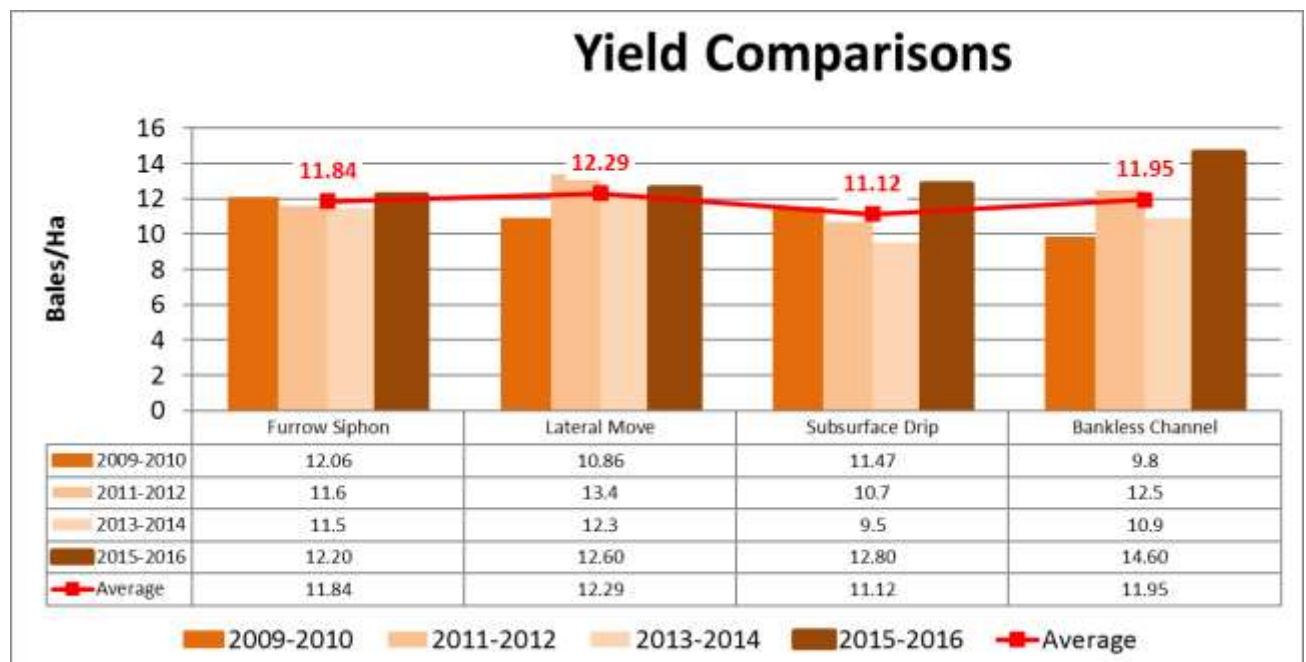


Figure 4 following combines the yield data for the four years of the trial. When combined, the lateral move is found to have the highest average yield over the four seasons. It is however important to note that there were significant establishment issues with the bankless channel in the 2009-2010 season which resulted in a significantly lower yield than expected.

Figure 4: Yield Comparison over four seasons



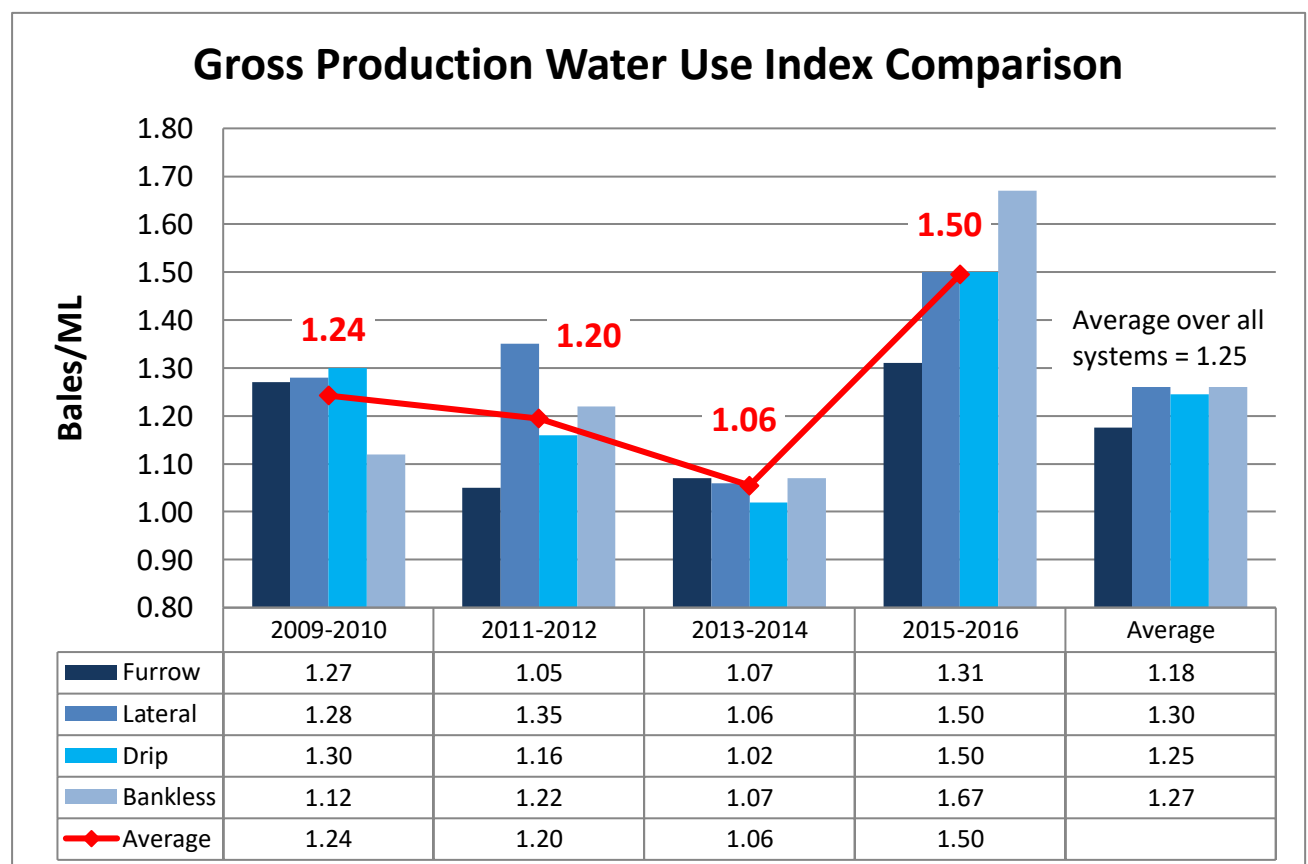
Despite running out of water in the 2015-2016 season all systems produced their highest yield for the four years. The system with the most consistent yield over the four years has been the furrow siphon system, although it appears to have been more impacted by the lack of a final irrigation in 2015-2016.

The variation in yield during the trial was less than the variation seen in water use efficiency and GPWUI between seasons. The Gross Production Water Use Index (GPWUI) is used to enable a comparison of the systems across years and across farms. It combines total seasonal water use (irrigation water and rainfall) with soil moisture and yield. The higher the GPWUI the more water efficient the crop.

Figure 5 following shows the GPWUI over the four years of the trial. It demonstrates that each season has been different. This may be a result of the variable climatic conditions in each season.

The 2009-2010 season was a typical season, while 2011-2012 was very wet and cloudy with two flood events. 2013-2014 was a warm to hot season with almost no rainfall and the final year irrigation ceased in February and there was no rainfall for the last three months of the season.

Figure 5: Gross Production Water Use Index



Individual system results

The Gross Production Water Use Index (GPWUI) is used to enable a comparison of the systems across years and across farms. It combines total seasonal water use (irrigation water and rainfall) with soil moisture and yield. The higher the GPWUI the more water efficient the crop.

Seasonal water includes rainfall and irrigation water received during the season, and is expressed as mega litres per hectare.

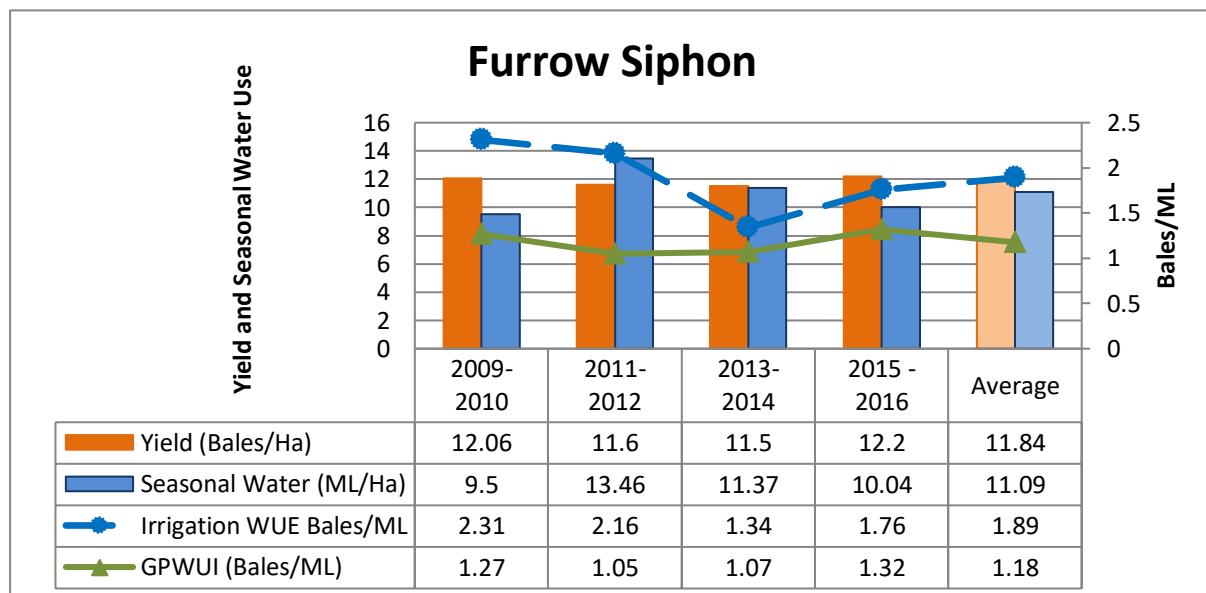
Irrigation water use efficiency considers only the irrigation water applied. It is expressed as bales produced per megalitre of irrigation water applied.

Furrow Siphon

The system comparison trial has confirmed that the furrow siphon system does produce consistent yield and a reasonable irrigation water use efficiency and Gross Production Water Use Index which is comparable to the other systems. The average yield was 11.84 bales per hectare, an irrigation water use efficiency of 1.89 bales per mega litre and a GPWUI of 1.18 bales per megalitre.

During the floods of 2011-2012 there was some waterlogging in the siphon field as a result of very heavy rainfall events. This potentially impacted the yield and the water use efficiency of the system. In contrast it produced the strongest GPWUI (along with the bankless system) in the hot dry 2013-2014 season. In 2015-2016 the siphon field could have benefited from a final irrigation or some late season rainfall. The limited moisture at the end of the season may have impacted the yield of the field, thus effecting the GPWUI.

Figure 6: Furrow Siphon System

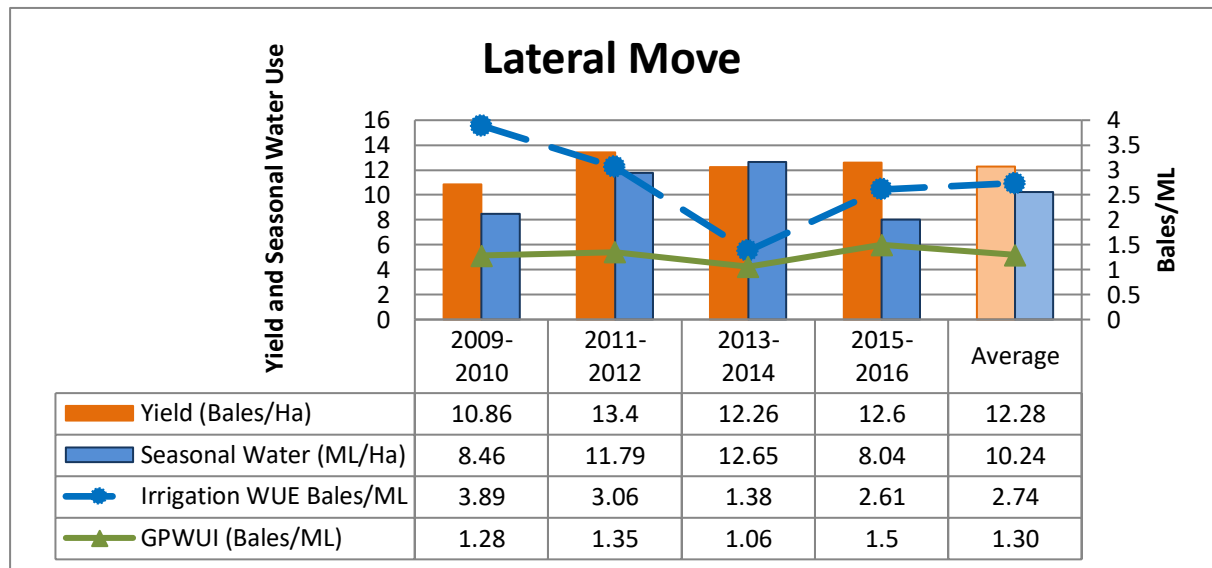


Lateral Move

The lateral move results shown in figure 7 below show that this system has the potential to produce the highest average yield, irrigation water use efficiency and GPWUI. The lateral produced an average yield of 12.28 bales per hectare, an irrigation water use efficiency of 2.74 bales per mega litre and a GPWUI of 1.30 bales per mega litre.

Figure 7 suggest that in a hot dry season as seen in 2013-2014 that the GPWUI has the potential to be compromised. In contrast the lateral system is well suited to wet seasons (2011-2012) where there were many rainfall events. It is easier to manage irrigation volumes with this system under these conditions. There was no water logging in the lateral in the 2011-2012 season.

Figure 7: Lateral Move System

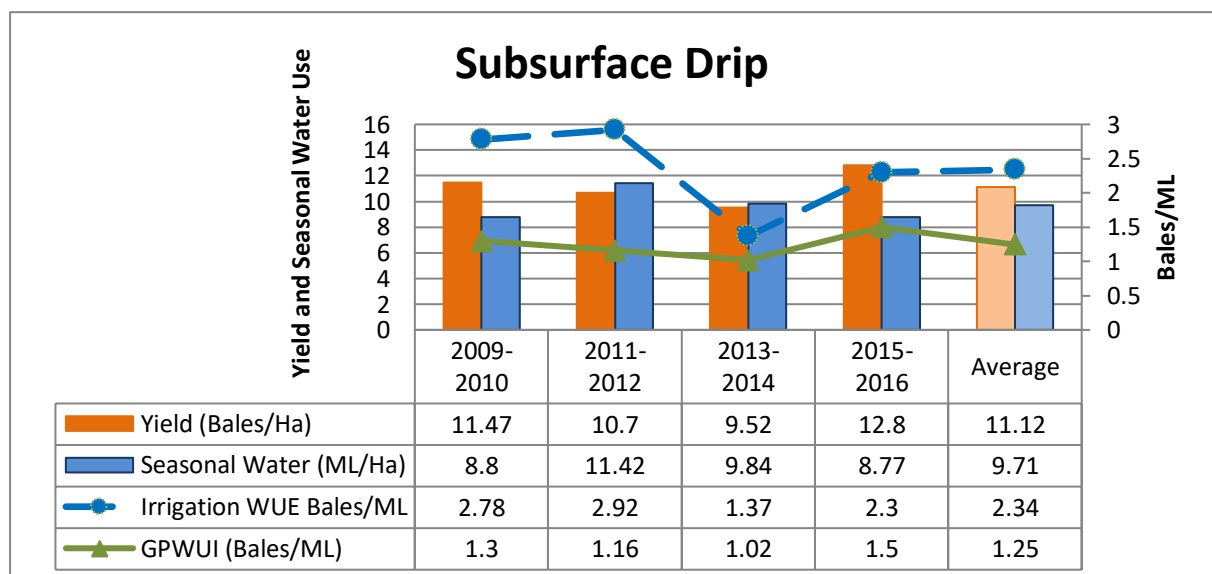


Subsurface Drip

Figure 8 following shows the findings for the assessment of the subsurface drip system. During the four years of the trial it has struggled to produce any consistency in yield but has achieved good irrigation water use efficiency results.

The performance of the drip was expected to be stronger in the wet 2011-2012 season, but there was some difficulty in removing runoff following several heavy rain events. This caused some waterlogging which may have affected the result. The hot conditions in 2013-2014 impacted the efficiency of the drip system. It was difficult to maintain sufficient irrigation water to the crop during the hot weather.

Figure 8: Subsurface Drip System



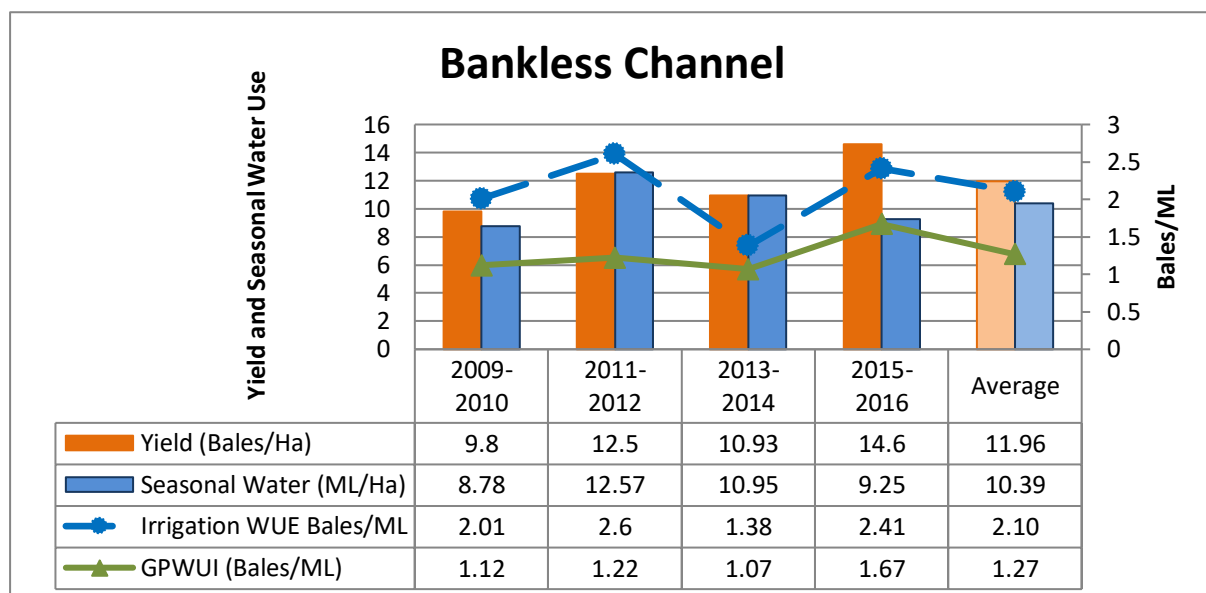
Bankless Channel

The bankless channel system results shown in figure 9 demonstrate that this system shows considerable promise. This is especially so if it is considered that the 2009-2010 season saw some significant establishment issues due to late field development. The yield achieved by the bankless channel system in 2009 – 2010 is believed to be low because of these establishment issues. The reduced yield would have influenced both the irrigation WUE and the GPWUI.

The system does not seem to have been impacted by any water logging in the wet 2011-2012 season. It produced the strongest GPWUI (along with the Siphon system) in the hot dry 2013-2014 season.

The yield result in 2015-2016 is significantly higher than all other systems, this may be the result of some other variable such as nutrition.

Figure 9: Bankless Channel System



Operational Data

Over the four years of the trial, data associated with the operation of each of the systems has been compiled. This is displayed in table 4 below. It includes labour, energy, capital and depreciation costs of each of the systems.

As expected, the labour requirement of the siphon system is very high compared to the other three systems. Labour is the biggest contributor to the total operation, maintenance and ownership cost of the siphon system. In contrast the bankless has very low labour costs; other costs associated with the set-up and maintenance of the bankless system are similar to the costs associated with setting up a siphon system. This means that when compared as a profit or loss relative to the siphon system (with water applied for an average year) that the bankless channel is more profitable than a siphon system.

The operational data for the two pressurised systems, shows that although the lateral move and the subsurface drip both produced favourable water use efficiency results, they were significantly more expensive to install than either the furrow siphon or the bankless channel. This has meant that they have produced losses on a \$/ha basis relative to the furrow siphon system. In addition, the labour required to manage these two systems is more technical than typically required for the siphon or

bankless systems. An additional consideration with both these pressurised systems is that any delay in application of irrigation water may have significant impacts, both systems are designed to more precisely apply water, so there is less margin for error.

Table 4: System Operational Costs

	Furrow Siphon	Lateral Move	Subsurface Drip	Bankless Channel
Operating Labour Cost @\$40/hr (\$/ha/yr)	\$134.40	\$22.40	\$8.00	\$11.20
Operating Energy Cost (fuel in L/ML/ha)	2.82	35.4	37.5	0.72
Operating Extras (rotobucks, siphon placement etc.)	\$18.00			
Total Operating Cost (\$/ha/yr.)	\$171.01	\$196.99	\$186.65	\$15.65
Ongoing Maintenance Cost (\$/ha/yr.)	\$20	\$110	\$25	\$15
Field Maintenance Cost (\$/ha/yr.)	\$80	\$50	\$40	\$140
Capital Setup Costs (\$/ha)	\$1,000	\$3,880	\$8,500	\$1,250
Total Operational, Maintenance, Ownership Cost (\$/ha/yr.)	\$291	\$551	\$592	\$196
Profit or Loss relative to Siphon with water applied for average year (\$/ha)		-\$35	-\$661	\$150

Discussion

2015-2016 season

The 2015 2016 season had a reasonably typical start but finished with higher than average accumulated day degrees and no effective rainfall past the end of January. In addition, there was not sufficient water to fully irrigate the trial, the last irrigations were applied in late February.

The yield performance for each of the systems was strong with all but the lateral move producing their highest yield over the four years of the trial. The yield of the bankless channel was noticeably higher than the other systems, which may have been caused by some other variable such as nutrition.

The yield of the furrow siphon was the lowest of the four systems. It received its last irrigation a few days before the bankless channel. It cut out before all the other systems and was defoliated five days before the other systems. This suggests that the furrow field was more badly impacted by the shortage of irrigation water at the end of the season.

The irrigation team adjusted the irrigation scheduling of the drip system slightly in the 2015-2016 season to try to improve the yield performance of the system. The yield achieved in the 2015-2016 season was 12.8 bales per hectare, more than a bale above any previous yield achieved with drip in the trial.

The Irrigation WUE and the GPWUI for the siphon system was below that achieved for the other three systems in 2015-2016. However, the GPWUI in 2015-2016 was the highest achieved by the siphon

over four seasons. This coupled with the earlier cut out and slightly lower yield of this system compared to the other systems, suggests that it may have been more significantly impacted by the lack of rainfall and irrigation at the end of the season.

The GPWUI for both the lateral and the drip systems was strong - 1.50 bales per mega litre, the highest achieved for either system over four years.

The bankless channel produced an even better GPWUI - 1.67 bales per mega litre, which is in part due to the very high yield achieved this season.

Four-year comparison

To enhance the value of the system comparison data it is important to look at the results over the four years of the trial. This information is presented in figures 4 to 9.

When the results are presented for each of the systems over the four years, it is possible to see trends in irrigation WUE and GPWUI which are most probably due to the seasonal conditions.

If we ignore the bankless channel results for 2009 – 2010, we can see that the irrigation WUE in 2009 – 2010 and 2011-2012 are quite high, possibly reflecting the typical 2009 – 2010 season and the cool wet 2011 – 2012 season. There is a noticeable reduction in irrigation WUE in 2013-2014 when there was very little in crop rainfall and warmer than average temperatures. The Irrigation WUE then increased in 2015 – 2016 when there was a shortage in irrigation water. All systems show similar trends, however the degree of impact of the hot dry 2013-2014 season on irrigation WUE was more pronounced in the lateral and drip systems.

A similar trend, can be seen with the GPWUI. The average GPWUI across all systems for 2009-2010 and 2012-2012 are 1.24 and 1.20 bales per mega litre respectively. The average of 1.20 bales per mega litre in the wet 2011-2012 was better than expected given that there was flooding and some water logging. In 2011 – 2012 the lateral performed strongly as it was possible to more precisely manage the applied water thus avoiding any water logging. It was expected that the result from the drip should have been similar to the lateral, however as with the siphon and bankless, there was difficulty in removing excess rainfall from this field, and some water logging was experienced.

The average GPWUI drops significantly in the hot dry 2013 – 2014 season and then increases noticeably in 2015 – 2016 when the trial ran out of irrigation water. The marked increase in GPWUI in 2015 – 2016 may be a result of the crop using more of the soil moisture reserves than in the other years of the trial. The average GPWUI across all systems over four seasons was 1.25 bales per mega litre.

When comparing the yield of the four systems over four years we can see that the furrow siphon has been the most consistent yield performer. From a long-term budget and on farm gross margin perspective this can be beneficial.

The highest average yield over the four seasons was 12.29 bales per hectare for the lateral move, while the lowest average yield was 11.12 bales per hectare for the drip system. The average yield for the bankless channel would have been higher if there had not been the establishment issues in the first year of the trial.

An important aspect of the comparison of these four irrigation systems is the operational components as shown in table 4.

The siphon system has high physical labour requirements associated with management of rotor-bucks, siphon placement and actually irrigating. It is estimated that this costs over \$130/ha/yr. The next most labour intensive is the lateral move, the labour needed for this system however must be more technically skilled than the labour needed for the siphon system.

The energy costs associated with pressurising water is also important. Both the lateral and drip in the trial are run with diesel engines and use on average over 35L/ML/ha. In seasons, such as 2013 – 2014, when they are run constantly to maintain water to the crop they may be very costly to run.

Combining the labour and energy costs of each of the systems it can be clearly seen that the least expensive system is the bankless.

The capital setup costs are also important. The lateral cost close to \$4,000/ha while the drip system costs over \$8,000/ha. Both the flood irrigation systems cost around \$1,000/ha to setup.

If all these aspects are considered the total operating, maintenance and ownership costs per hectare per annum for the lateral and drip are over \$550, the siphon is \$291 and the bankless is \$196. If the profit or loss is compared with the average water applied for an average year relative to the siphon system it suggests that the bankless would deliver a profit of \$150/ha, the lateral a loss of \$35/ha and the drip a loss of over \$600/ha.

Conclusions

The results from the four years of the grower-led irrigation system comparison trial shows that there is no single system which will deliver perfectly to the requirements of the industry. Irrigation needs will differ by farm, by region and by season.

There are indications that improvements in water use efficiency can be achieved with the lateral move and drip systems, and that good yield can be achieved with the lateral move. The difficulty with both these systems is that there is a high capital setup cost and a high operating energy requirement. As a result, the data suggests that growers would be carrying a loss relative to the siphon system if they were to invest in either of these systems. An additional consideration is water reliability; in regions where there is low reliability it may be necessary to carry the capital costs in a season where the system is not utilised, as irrigation water is not available.

The two flood irrigation systems, siphon and bankless, have significantly lower capital setup costs and minimal energy requirements. The siphon system however does have a high labour requirement and it is becoming increasingly difficult to source this labour.

This suggests that the bankless channel system is the preferred option, but the topography of the farm will impact on the suitability of this system. The bankless system works most effectively when the slope is developed correctly. In many cases this will require the removal of large volumes of top soil. The removal of 0.5 – 1m of top soil has the potential to have significant yield impacts and is not seen by many growers as a preferred course of action. Where there are existing siphon fields, it may not be practical to change to bankless.

In addition, the trial showed that the seasonal conditions can have significant impacts on the WUE and hence the suitability of each of the systems. In hot dry seasons it will be necessary to run the lateral or drip systems almost continuously to maintain the crop. This has the potential to significantly increase the cost of running these systems. The water use efficiency of all systems was affected in the hotter dryer seasons. In wet overcast seasons there is more flexibility to manage applied water in the

pressurised systems than in the flood irrigation systems. However, it is still critical to ensure that any excess water can freely drain from these fields following heavy rainfall.

The findings highlight that growers looking to make investment in irrigation upgrades need to consider a range of factors including; soil, topography or existing land use, water reliability, crop type and financial capital. In addition, growers need to consider the availability of labour and the energy requirements of each of the systems.

The GVIA grower-led irrigation system comparison has demonstrated that although WUE is important, changes to irrigation systems focused solely on WUE may not be practical. To remain profitable and productive, growers need to conduct an analysis of all the components that contribute to the efficiency of an irrigation operation.

Publications

System Comparison brochure and poster produced for the Australian cotton Conference in August 2016 and video available on the GVIA website: <https://www.gvia.org.au/community-and-industry-initiatives/irrigation-efficiency/keytah-system-comparison/>

Appendix

Table 4:

30 Inch	System	Ha's	Ha's Picked	Total Modules	Average Turnout	TOTAL BALES	ACTUAL YIELD/HA	ACTUAL YIELD/ACRE	Irrigation Water Applied (meg/ha)	WUE of Applied Irrigation Water (bales/meg)
K28	Furrow Siphon	86.7	86.7	261	41.7%	1055	12.2	4.92	6.91	1.76
K29	Bankless Channel	32.7	32.7	112	42.3%	478	14.6	5.92	6.06	2.41
K30 nth	Subsurface Drip	5.5	5.5	19	41.2%	145	12.8	5.19	5.57	2.41
K30 sth		5.9	5.9	19					5.58	2.23
L1	Lateral Move	124.4	124.4	394	41.7%	1573	12.6	5.12	4.85	2.61

NB: There were 2 broken rounds from L1, that were not included

RRDPI606 Technical Research Report

June 2017

Grower led research in irrigation system comparison in the Gwydir
Valley

Optimised Irrigation Row Configuration Trial

Gwydir Valley Irrigators Association Inc.

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Executive Summary:

The Gwydir Valley Irrigators Association (GVIA) 2016-17 Optimised Irrigation Row Configuration was the fourth application of the commercial trial investigating water-use efficiency optimisation techniques of siphon irrigation. The trial was initially conducted in 2014-15 with CRDC grassroots grant funding. Further work was conducted in 2015-16 as part of the CRDC1302 project and the final set of data was supported by the RRDP1606 CRDC and the Australian Government Department of Agriculture and Water Resources as part of the Rural R&D for Profit program.

The objectives were to examine options to improve water-use efficiency of siphon irrigation and to investigate the relative yield potential of different row configurations under optimal irrigation conditions. Siphon is the standard industry irrigation system currently in use, despite recent moves to other irrigation systems, such as bankless channel.

The row configurations assessed in the trials included the standard 40inch (100cm), as well as areas of 30inch (75cm), 60inch (150cm) and 80inch (200cm). The project evaluated the trial in terms of yield and applied irrigation water, relative to the standard 40inch row configuration. The information from the trials will enhance the understanding of the potential of each of these row configurations to produce under optimal water.

One of the drivers for the trial was managing compaction. Machinery wheel spacing in a (40inch) one meter or (80inch) two meter configuration is two meters, while for either a (30inch) 75 centimetre or (60inch) one point five meter configuration it is three meters. Typical dryland cropping systems utilise three meter wheel spacing. Farming systems incorporating both dryland and the standard irrigated 40inch cotton utilise machinery with both two and three meter wheel spacing, which can significantly increase the percent of the field compacted. Demonstrating that yield and water use efficiency can be maintained or improved with a 30inch spacing would be beneficial for growers considering practice change to a 30inch configuration. Converting cotton irrigation to 30 or 60inch would mean only machinery with three meter wheel spacing would be necessary, a step towards true control traffic farming. Adoption of control traffic farming reduces the area of paddocks wheeled by machinery and hence compacted. This is beneficial for growers working to improve water use and nutrient use efficiency.

Through the project the GVIA was able to collect data which increased the level of understanding of the benefits and possible disadvantages associated with different row configurations under siphon irrigation.

The results from the 30inch spacing are encouraging. They suggest that three percent less water would be used with an average of a three percent yield drag. This finding however, included a 30inch plot which was replanted and rewatered in 2014-2015. The results from Keytah in 2014-2015 suggest that there may be possible yield advantages over 40inch.

The trial suggested that the yield reduction from a fully watered 60inch spacing would be around 20 percent, and on average would use two percent less water, while the 80inch cotton would be expected to yield 37 to 27 percent less than the 40inch spacing and use on average 14 percent less water.

Introduction:

In 2012/13 the Gwydir Valley Irrigators Association (GVIA) was successful in sourcing funding through the Cotton Research and Development Corporation (CRDC) to continue to investigate water use efficiency in the Gwydir Valley. A component of the project was to conduct an off-season trial to further explore ways to optimise water use efficiency and help growers adapt to less water. This project was further supported through the Gwydir Valley Cotton Growers Association (CGA) with a CRDC Grassroots grant. In 2016-2017 the trial was incorporated into the RRDP1606 part of the Smarter Irrigation for Profit Project, made possible with funding from the CRDC and the Australian Government Department of Agriculture and Water Resources Rural R&D for Profit Program. This report summarises the four sets of data collected over the three years of the project.

Irrigation application methods are essential to maximizing yield and water use efficiency in the irrigated cotton industry. The Optimised Irrigation Row Configuration project investigated water-use efficiency techniques of the siphon irrigation system, which is the standard industry practice. The trial investigated the relative yield potential and irrigation Water Use Efficiency (WUE) of different row configurations under optimal irrigation.

The trial will provide growers more detail of the maximum potential yield of each of these row configurations under optimal water. Additionally, it will provide information on the water savings which may be achieved from each of the row configurations compared to 40inch (1m). This greater understanding will help growers determine which row configuration is best suited to their operations especially in seasons where water availability is limited at planting or where mixed dryland and irrigated farming systems are utilised.

The standard 40inch configuration uses machinery with two-meter wheel spacing. In contrast the typical dryland cropping system uses machinery with three-meter wheel spacing. Where farming operations include both the standard 40inch irrigated cotton and dryland cropping, compaction from using machinery with both two and three meter wheel spacing can be significant. Reducing the area of the field trafficked can help reduce compaction. Reducing compaction can have benefits from a water or a nutrient use efficiency perspective.

Project Objective:

To achieve a more resilient and competitive cotton farming system through increasing the understanding and awareness of the benefits and disadvantages which may be associated with different row configurations, and the practices that help to optimise siphon irrigation systems.

Specific Aims:

1. Increase the understanding and adoption of practices that optimise the furrow irrigation system.
2. Increase the awareness and understanding of the yield potential and water requirements of various furrow irrigation row configurations.
3. To help growers to maintain productivity in mixed irrigated and dryland system.
4. Increase the number of irrigators that assess their own irrigation performance through demonstrating practical methods to assess irrigation performance on farm.
5. Increase grower ownership of research by developing grower and industry partnerships throughout the project.

Goal of Optimisation Trial:

This trial is intended to investigate the relative yield potential of a number of row configurations under optimal irrigation. The intention is to provide irrigators a more detailed understanding of the fit of each of these different row configurations to produce under optimal water. This will assist irrigators, especially in areas where reliability of irrigation water is low, to make informed decisions on planted area, crop rotations, soil compaction and irrigation management.

Objectives of Optimisation Trial

1. Investigate water-use efficiency optimisation techniques of furrow irrigation under different row configurations.
2. Demonstrate fit of different row configurations in holistic farming system
3. Demonstrate optimisation techniques of furrow irrigation.
4. Evaluate in terms of water-use efficiency.
5. Increase the level of understanding of the pros and cons associated with different row configurations under furrow irrigation.

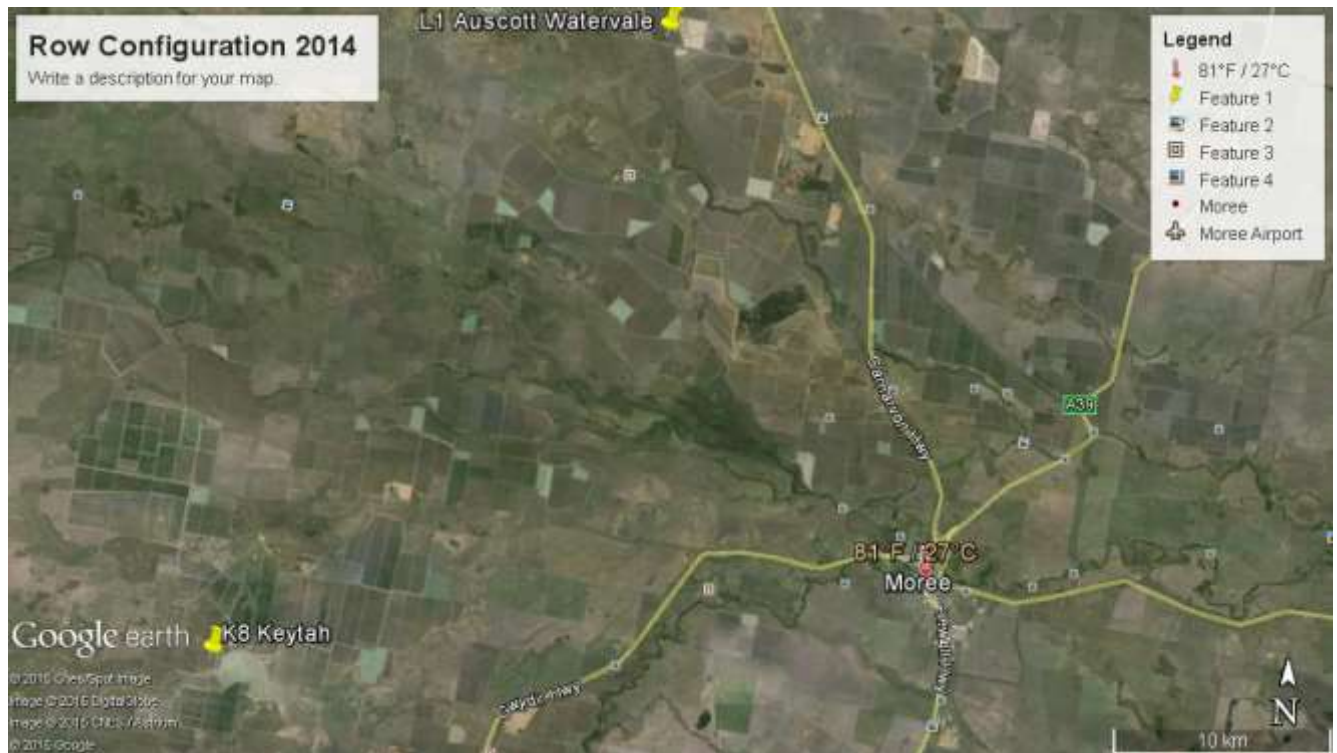
Location and Trial Design

The row configuration trial was planted at two locations, Keytah and Auscott. Keytah is approximately 35Km West of Moree, while Auscott is approximately 35Km north of Moree.

The trial involved the comparison of four different row configurations; 30inch (0.75m), 40inch (1m), 60inch (1.5m) and 80inch (2m). In 2014-2015 the sites were set up as split plot randomised block design with 12 by 24m plots, 3 replicates per row spacing. This proved difficult to manage on a commercial basis and made measuring water on and off more difficult. In 2015-2016 the trial was not replicated, however in 2016-2017 it was again replicated.

Each of the row configurations was watered as required with the aim to maximise the yield of each treatment. Measurements were made of total water applied and total water off each of the row configurations. In each of the three season the applied water and yield for each of the row configurations were combined as it was not possible to measure water applied separately for each plot.

Figure 1: Trial location map



Field Layout and Trial Design

Figure 2: Keytah 2014-2015 trial location design

Table 1: Keytah trial



Plot	Treatment	24 Meters
1	30inch	32 rows
2	60inch	16 rows
3	30inch	32 rows
4	60inch	16 rows
5	60inch	16 rows
6	30inch	32 rows
7	80inch	12 rows
8	40inch	24 rows
9	40inch	24 rows
10	80inch	12 rows
11	80inch	12 rows
12	40inch	24 rows

Figure 3: Auscott Watervale 2014-2015 trial location

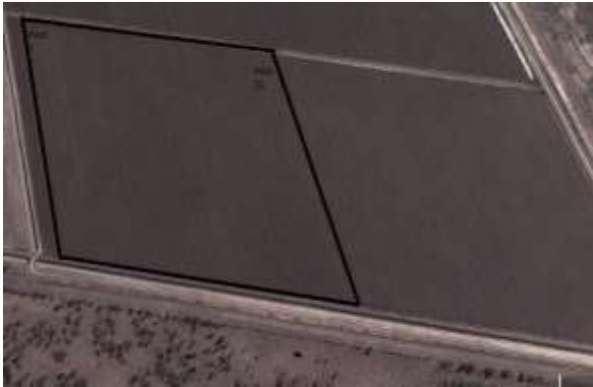


Table 2: Auscott Watervale trial design

Plot	Treatment	Meters
1	30inch	32 rows
2	80inch	12 rows
3	40inch	24 rows
4	60inch	12 rows
5	60inch	16 rows
6	40inch	24 rows
7	40inch	24 rows
8	30inch	32 rows
9	60inch	16 rows
10	80inch	12 rows
11	30inch	32 rows
12	80inch	12 rows

Figure 4: Auscott Watervale 2015-2016 trial location



Table 3: Auscott Watervale trial design

Plot	Treatment
2	60inch
3	30inch
8	40inch
11	80inch

Figure 5: Auscott Midkin 2016-2017 trial location

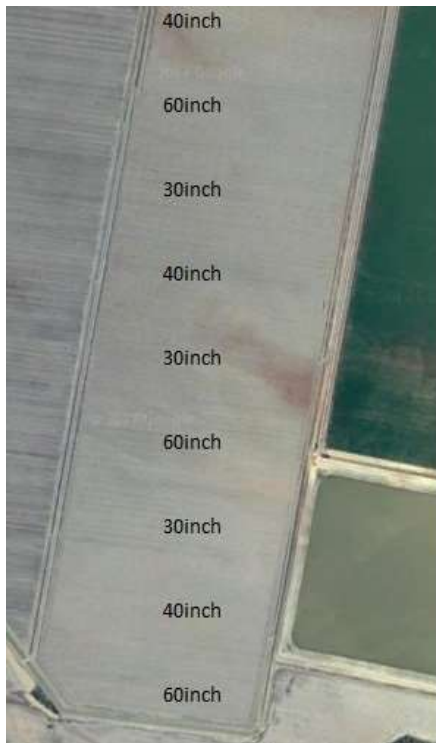


Table 4: Auscott Midkin trial design

Plot	Treatment
1	40inch
2	60inch
3	30inch
4	40inch
5	30inch
6	60inch
7	30inch
8	40inch
9	60inch

Trial Features and Variables

The trials were made possible due to the support of our trial partners Auscott and Sundown Pastoral Co. Of importance was the difference in the row configuration on each farm; Keytah utilises a 30inch system with 1.5m beds, while Auscott utilises the industry standard 40inch system with 1m beds. Both organisations developed areas of the trial to represent the alternate bed structure not typically used in their operations. The alternate bed structure was more difficult to manage for both organisations in 2014-2015. In 2015-2016 and 2016-2017 the Auscott staff were more confident in the field preparation and the watering of the 30inch configuration. In both years field preparation was initiated well in advance of the season to ensure that bed had stabilised prior to planting.

Where ever it was practical all treatments were watered as they required. The timing of irrigations was determined by the on-farm agronomy team based on information from C-probes and crop observation. To streamline irrigation management across the farms the broader row configurations and the narrow row configurations were generally irrigated at similar timings.

Canopy temperature sensors were installed in the trial in 2014-2015 but were not used for scheduling as data was not readily available at a farm level.

Monitoring method and equipment:

Total water on and total water off was measured for each treatment for each irrigation using Mace meters. To achieve this with the small size of the irrigated plots both farms had to design and

fabricate drop boxes specifically for the trial. This enabled the most accurate measure of the water off each treatment. Individual replicates could not be measured separately.

The trial required careful management and observations by the irrigation managers. The timing of siphon start-up and observation of when water finished flowing from the field were some of the details which had to be recorded by the irrigation teams. Additionally, they recorded Mace readings for all irrigation steps. This coupled with downloaded Mace meter readings enabled the determination of water use by each treatment.

Water Assessments

- All treatments were planted dry and watered up
- C-probes were installed early season and used by the irrigation teams to monitor crop water use.
- C-probes were removed prior to picking.
- The sum of all water on each treatment, less all water off totalled the water used.

Rainfall and Temperature:

Rainfall information was collected on farm using Irrisat rain gauge at Keytah.

Auscott had access to C-Probes with rainfall measuring capacity in trial.

Temperature and humidity information was sourced from the Moree Bureau of Meteorology (BOM).

Meters:

All water on and water off for each treatment was measured with Mace meters at the head and tail drain of the field.

The tail drain Mace used in conjunction with rainfall data measured rainfall runoff.

There were some issues with the Mace meters at Auscott, and some early season measures were not as accurate as we had hoped.

C-Probes:

C-probes were installed in each treatment. These were used throughout the growing season by the on-farm agronomy teams to schedule irrigations and monitor the plants' uptake of water.

All probes were positioned, and soil core samples taken from locations, using EM and topography maps. Only post season soil cores were taken from Auscott as past experience has found the information of little value.

Agronomics:

Farm agronomists optimized management for each treatment with the objective to maximise the potential with regard to yield and water.

Results:

Seasonal Data:

Figure 4 shows the accumulated day degrees over the three trial seasons. 2014-2015 and 2015-2016 were consistently warmer than the 61-year average from the 1st of September to the end of May. There were cold shock days through to early October in 2014 and 2015, and through to mid November in 2016. Keytah was planted in late October and Auscott was planted in November. January and February in 2017 saw a run of hot conditions which caused significant issues for the crop.

Figure 4: Accumulated Day Degrees

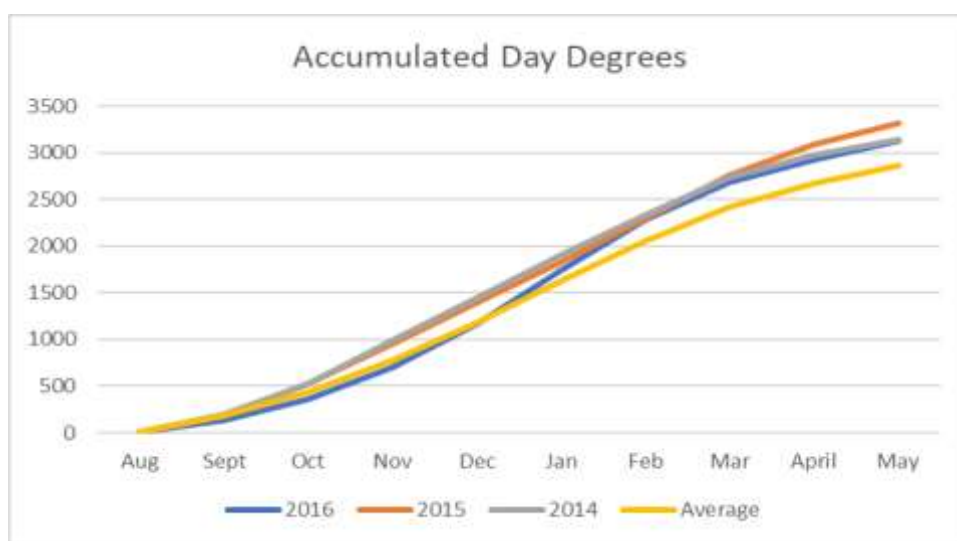


Figure 5: Keytah 2014-2015 Rainfall

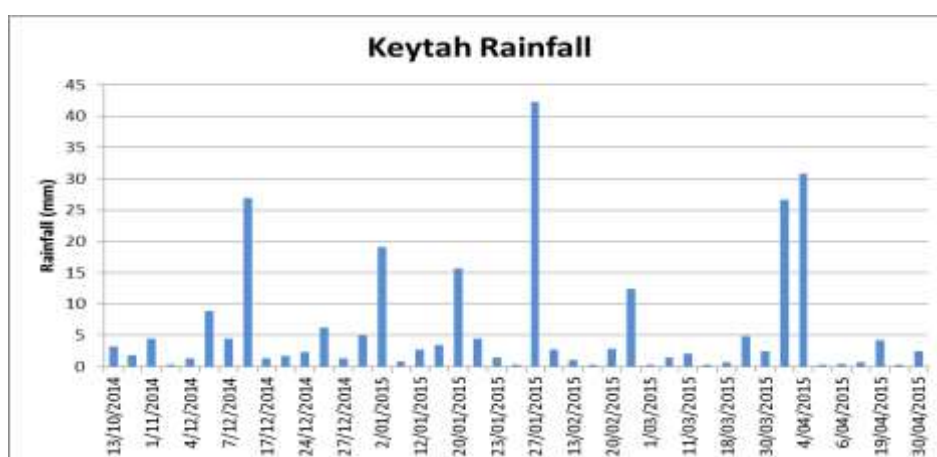


Figure 6: Auscott Watervale 2014-2015 Rainfall

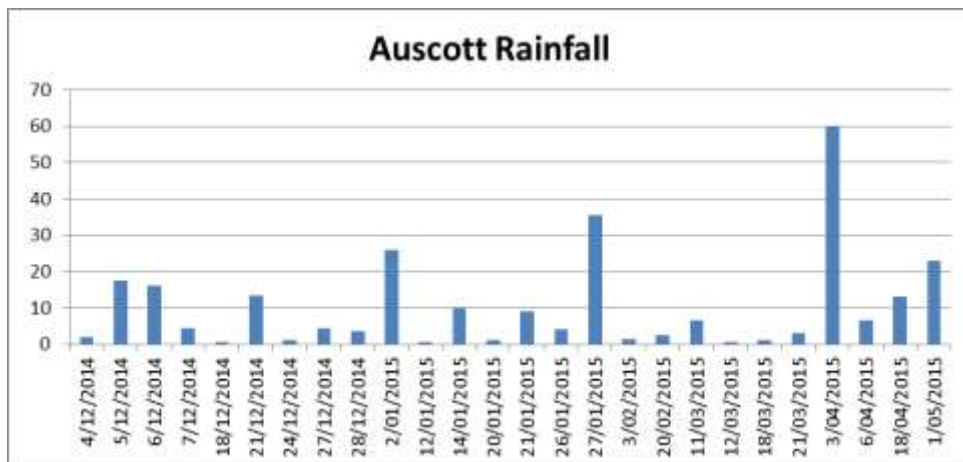


Figure 7: Auscott Watervale 2015-2016 Rainfall

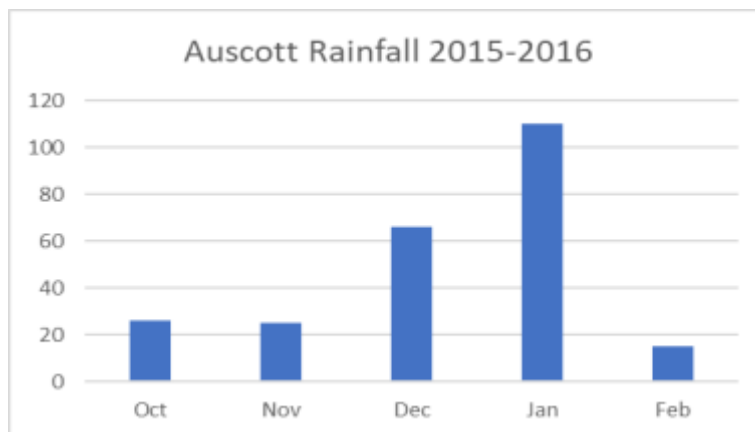
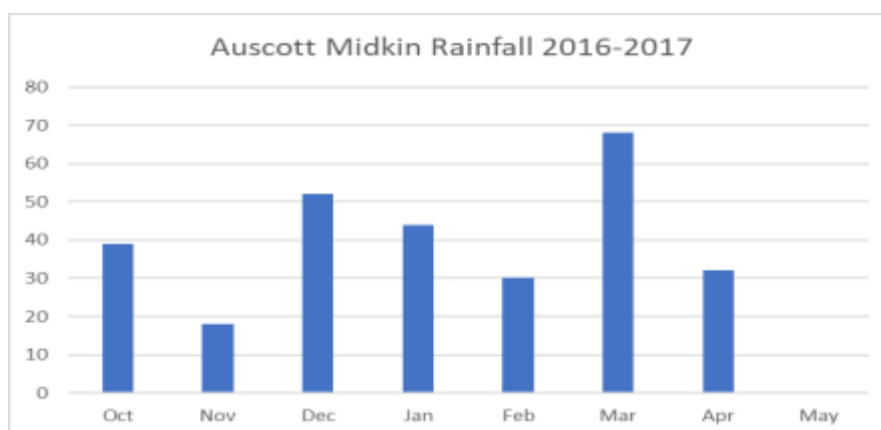


Figure 8: Auscott Midkin 2016-2017 Rainfall



Figures five to eight show the seasonal rainfall for each of the sites; Keytah received 254 mm, in 2014-2015 Auscott Watervale received 266mm, in 2015-2016 Auscott Watervale received 242mm and in 2016-2017 Auscott Midkin received 283mm.

Agronomic Summary

Table 3: Irrigation and management

	Keytah	Auscott	Auscott	Auscott
Year	2014-2015	2014-2015	2015-2016	2016-2017
Standard farm row spacing	30inch on 1.5m beds	40inch on 1m beds	40inch on 1m beds	40inch on 1m beads
Soil type	vertisol	vertisol	vertisol	vertisol
EM survey soil variation	<9%	<5%	<5%	<5%
Planting date	27 th October 2014	9 th November 2014	18th October 2015	12th October 2016
re-plant		60inch: 21 Nov 30inch: 27 Nov		
30inch irrigation	6.62ML/Ha	6.99ML/Ha	6.62ML/Ha	7.96ML/Ha
40inch irrigation	7.37ML/Ha	7.38ML/Ha	6.86ML/Ha	7.28ML/Ha
60inch irrigation	5.17ML/Ha	6.75ML/Ha	5.17ML/Ha	7.17ML/Ha
80inch irrigation	5.53ML/Ha	5.88ML/Ha	4.83ML/Ha	
Rainfall	254mm Oct - April	266mm Dec - May	242mm Oct - Feb	283mm Oct-May
Picking	18 th and 19 th May 2015	1 st to 3 rd June 2015	4th and 5th April 2016	12th May 2017

Table three provides a summary of the four sites. Included in the table are details of the soils and standard on-farm systems. Additionally, it provides planting, rainfall, irrigation and picking information for the trial sites.

Yield and Water Use

All assessments of water use, and yield combine each of the individual replicates of each row configuration. This was necessary as it was not possible to measure the water applied to each of the individual replicates.

Water use differences between the row configurations were compared with either seasonal water use efficiency or irrigation water use efficiency. Seasonal water use efficiency considers all rainfall and irrigation water applied during the growing season and is expressed as bales per megalitre. Irrigation water use efficiency considers only the irrigation water applied during the season and is expressed as bales per megalitre.

Yield is the amount of ginned cotton lint produced from each of the treatments expressed as Bales per Hectare.

Figures nine to 12 following provide a summary of the yield and irrigation water use efficiency for the trial sites. In 2014-2015 at both Keytah and Auscott Watervale the standard row configuration used on farm produced both the highest yield and the best irrigation water use efficiency (WUE).

Figure 9: Keytah yield and WUE

Figure10: Auscott 2014-2015 yield and WUE

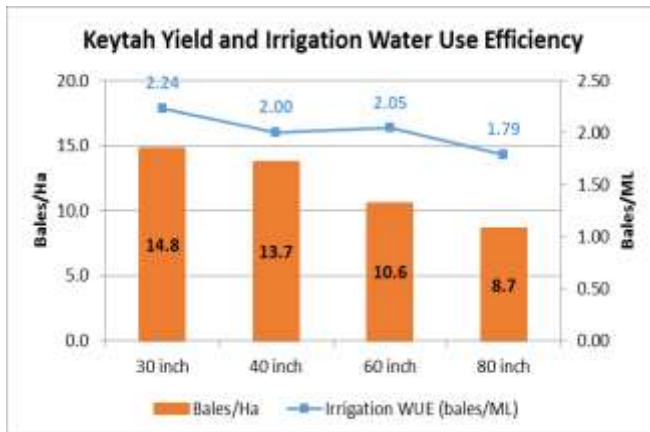


Figure 11: Auscott 2015-2016 Yield and WUE

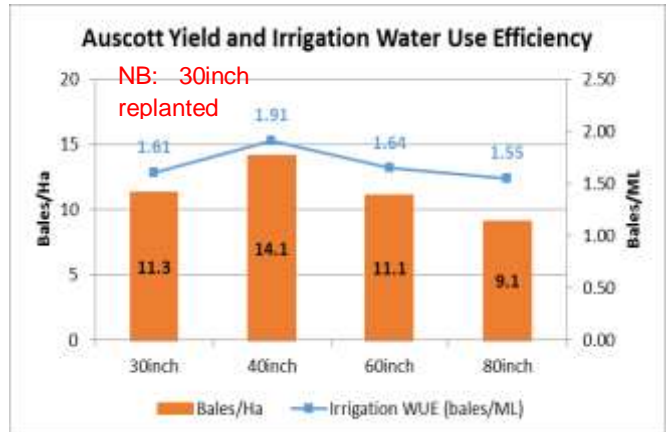


Figure 12: Auscott 2016-2017 Yield and WUE

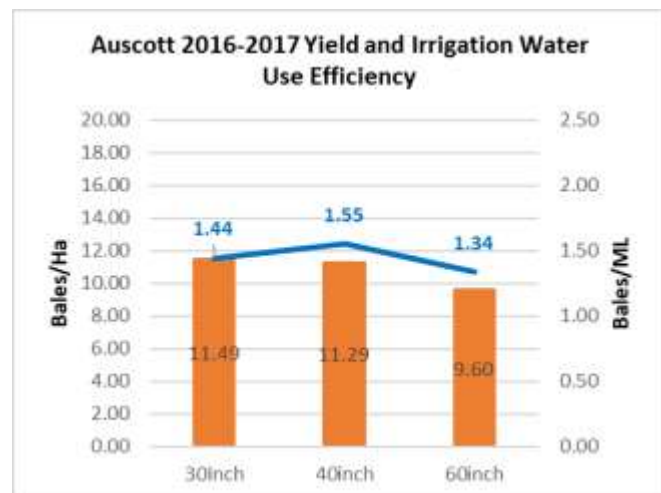
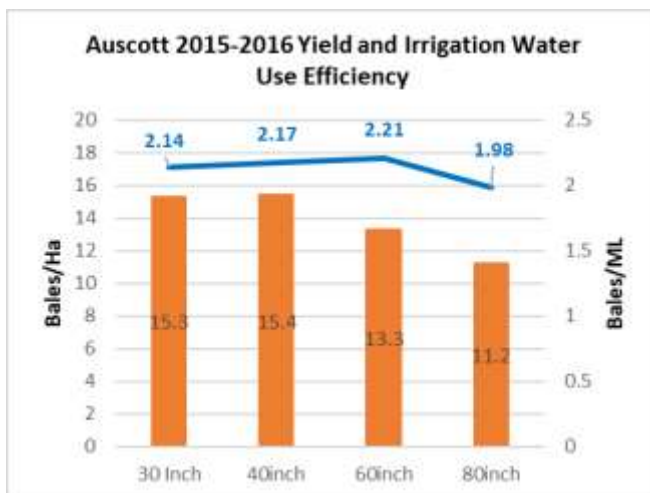


Figure 13 following depicts the yield of all row configurations at the four trial sites relative to the industry standard 40inch. It shows that at Keytah the 30inch yielded eight percent more than the 40inch, and that on average the yield from 30inch is 97% of the 40inch; this includes the 2014 - 2015 replanted plots at Auscott. The 60inch yielded on average 18 percent less than the 40inch, while the 80inch yielded an average of 33 percent less than the 40inch.

Figure 13: Yield relative to 40inch

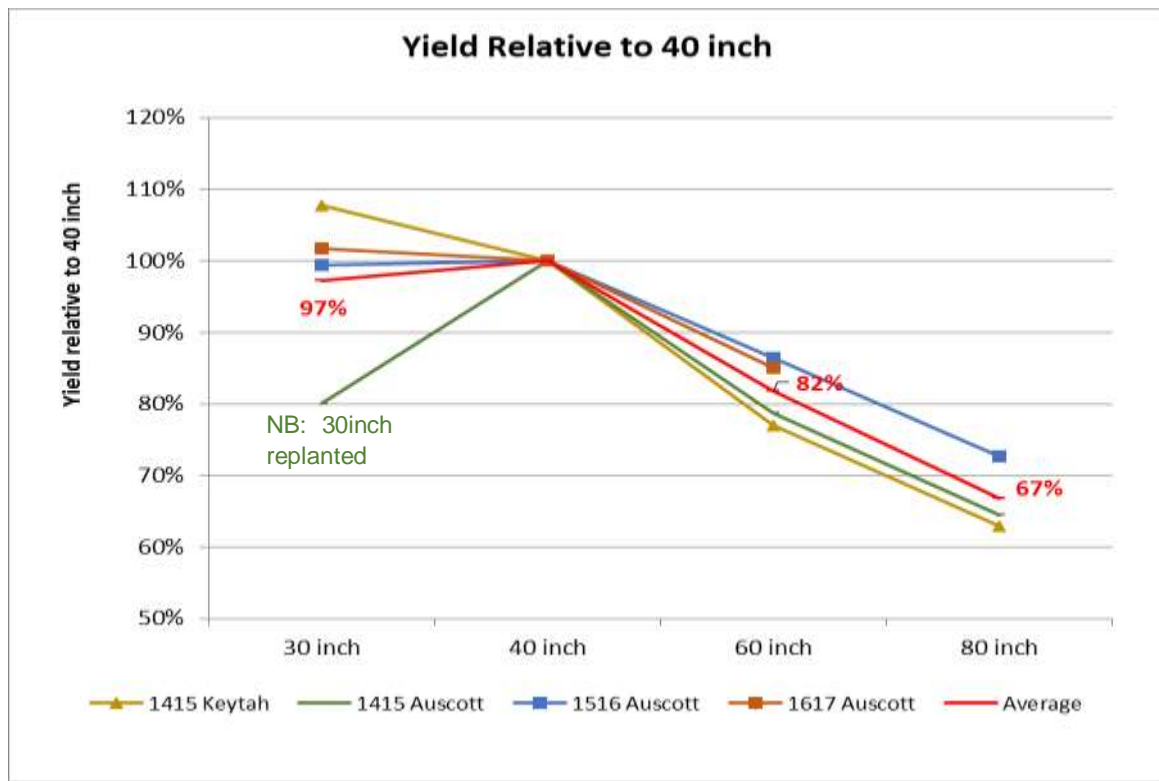


Figure 14 provides a more detailed yield summary, which shows that the yield difference between the 30 and 40inch is very minimal. The 60inch with 33 percent less green hectares and the 80inch with 50 percent fewer green hectares have markedly reduced yields.

Figure 14: Trial yield summary

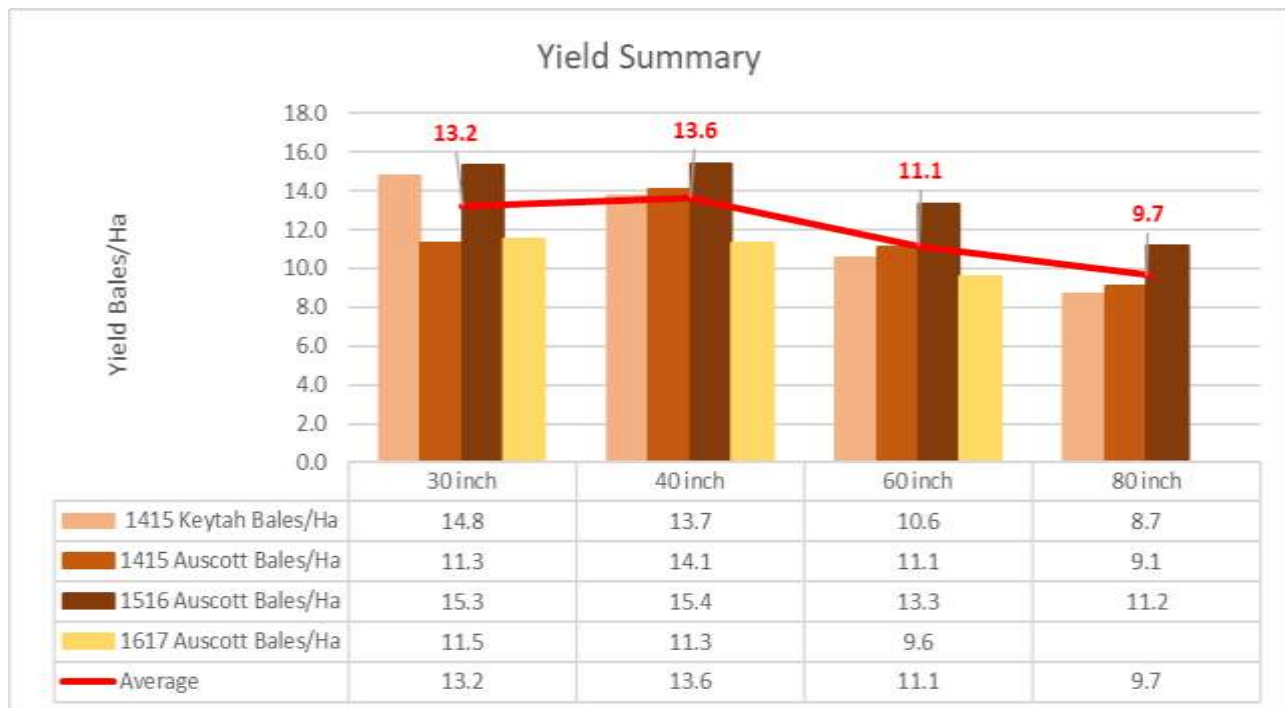


Figure 15: Irrigation Water Applied

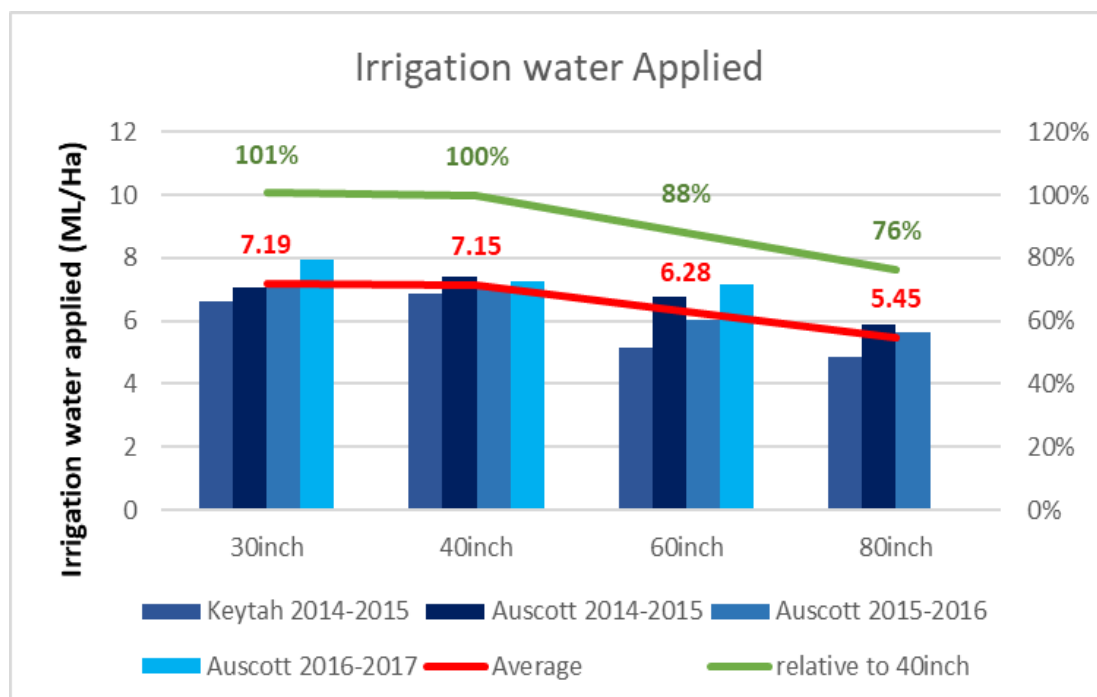


Figure 15 above provides more detail of the irrigation water applied in the trials. The 30 and 40inch configurations received on average 7.19 and 7.15 mega litres per hectare respectively. The 60inch received 12 percent less water with an average of 6.28 mega litres per hectare and the 80inch 24 percent less with 5.45 mega litres per hectare.

Figure 16 and figure 17 following provide more detail on the irrigation water use efficiency of the four sites. The 30, 60 and 80inch plots used three, five and seven percent less water relative to the 40inch.

Figure 16: Irrigation Water Use Efficiency Summary

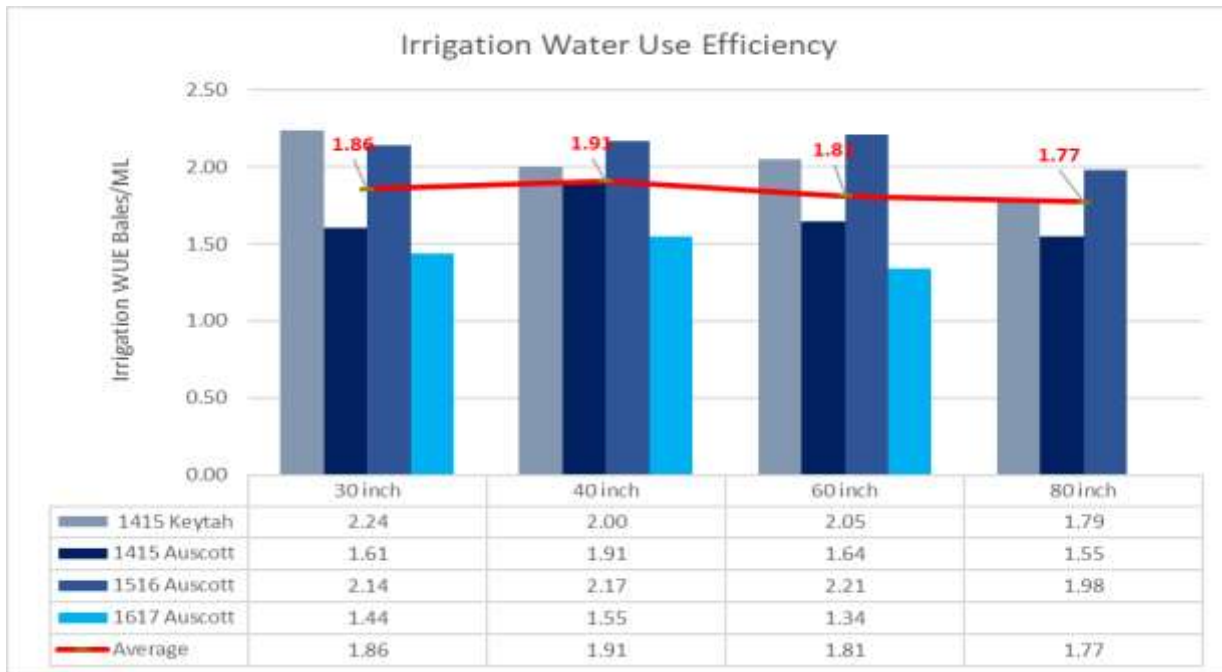
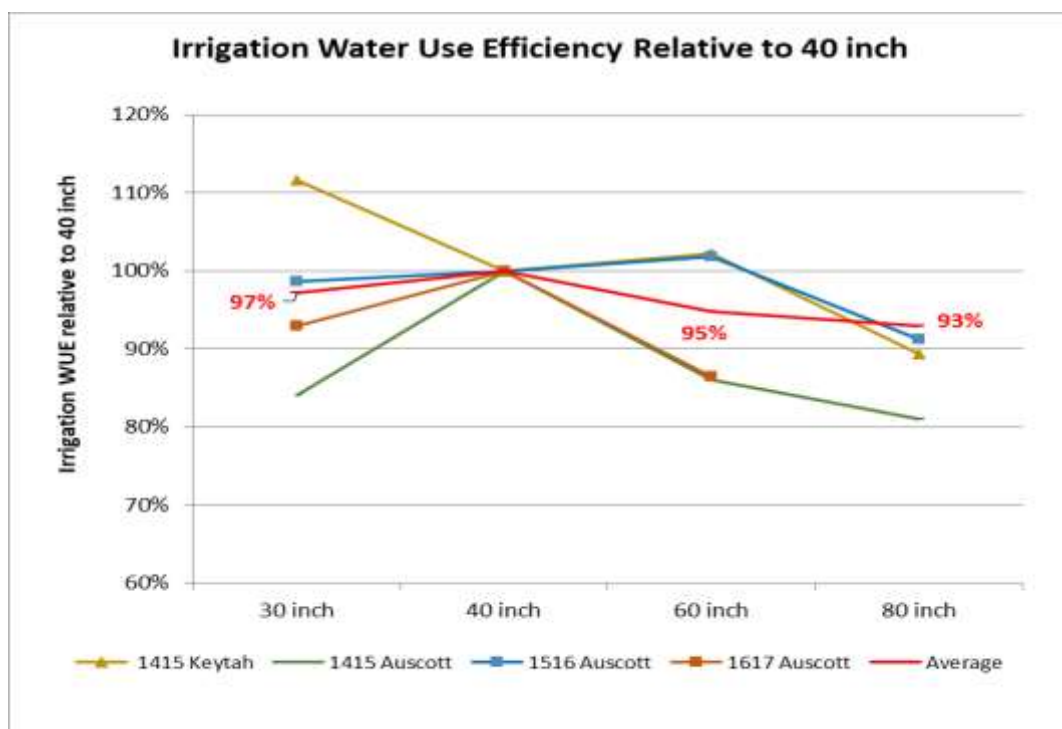


Figure 17: Irrigation Water Use Efficiency Relative to 40inch



Discussion

The four Irrigated Row Configuration trials have provided useful information which growers will be able to utilise in farming system decisions going forward.

The objective was to determine what the maximum yield potential was for each of the different row configurations under optimal water. The yield and irrigation water applied as seen in figures nine to 16 depict the trial findings.

The data has shown that there is little difference in the yield or irrigated water use efficiency between the 30inch and the 40inch row configurations. As shown in figure 14, the average yield over four trials for the 30inch was 13.2 Bales/Ha, three percent less than the 13.6 Bales/Ha average for the 40inch configuration. It is important to note that the 30inch average includes the replanted plot at Auscott in 2014-2015, where there was a yield penalty possibly due to the replant. The highest yield achieved for both configurations were over a bale more, at 15.3 Bales/Ha in the 30inch plots and 15.4 Bales/Ha in the 40inch plots at Auscott in 2015-2016. There was minimal difference in the amount of irrigation water applied to either the 30 or 40inch.

When yield is reviewed in conjunction with the irrigation water use efficiency in figure 16, it reaffirms the similarity of both narrow row configurations. The average 30inch water use efficiency of 1.86 Bales/ML is three percent less than the 40inch at 1.91 Bales/ML.

Given that the performance of both the 30inch and the 40inch were similar with regard yield and water use efficiency; growers who grow both dryland and irrigated crops can confidently shift to a 30inch configuration without compromising either. The shift to a 30inch configuration would mean that machinery with three meter wheel spacing can be used in both dryland and irrigation, this will reduce the percent of the field trafficked and hence reduce the amount of soil compaction. There is potential for improvements in water and nutrient use efficiency from reduced soil compaction.

For the 60inch, the highest yield was 13.3 Bales/Ha at Auscott in 2015-2016. The average 60inch yield was 11.1 Bales/Ha with an average of 6.28 mega litres per hectare of applied irrigation water, or 12 percent less than the 40inch. The average irrigation WUE of the 60inch plots was 1.81, five percent less than the 40inch.

In the 80inch plots, the highest yield was 11.2 Bales/Ha at Auscott in 2015 - 2016. The average yield was 9.7 Bales/Ha from 5.45 mega litres per hectare of irrigation water. An average of 33 percent less than the 40inch, using an average of twenty four percent less water. The 80inch configuration was not planted in 2016 - 2017 as it is not expected to be commonly utilised as an irrigation option in the industry.

One finding with the trials was that bed preparation is important. In 2014-2015 there was limited lead time between bed development and planting at both sites. There were some issues when the trial was watered-up, resulting in replanting at one of the sites. In the subsequent two seasons good early bed preparation ensured there were no issues with watering or crop establishment.

Conclusions:

The four row configuration trials have demonstrated that the 30 and the 40inch row configurations are both very similar with regard yield potential and irrigated water use efficiency. The yield performance of the two narrow row configurations is very similar, with a yield variance of only three percent (including the replanted 2014-2015 data). Where there is sufficient water to fully irrigate,

the findings suggest that either a 30inch or a 40inch row configuration would produce high yields. They both also have good irrigation water use efficiency, using on average 7.19 and 7.15 mega litres per hectare.

When availability of irrigation water is not limited, a solid plant of 30 or 40inch both have the potential to produce robust yields with good water use efficiency. In situations where irrigation water is limited, and a solid plant may not be appropriate, growers can now make more well-informed decisions on what configuration to plant.

The data suggests that growers who are set up with the standard 40inch bed configuration could move to 80inch configuration when faced with limited water. If the 80inch spacing is then watered to try to maximise yield, it would result in an average yield reduction of 33 percent, but there would be a saving of twenty four percent in irrigation water under optimal irrigation. In situations where growers fully irrigate 60inch configurations which if fully irrigating to maximise yield would have on average an 18 percent yield penalty but would use on average 12 percent less water.

The trials indicate that under optimal irrigation the water use efficiency of this wider row spacing is five to seven percent less than for the 40inch spacing. Using this information with the other production costs and the price of cotton, growers can then determine if they should be planting a smaller area of either 30 or 40inch cotton, rather than a larger area of 60 or 80inch cotton.

The decision as to which row configuration is most appropriate for growers will depend on crop rotation and the farm operations. Cotton growers who grow a range of irrigated and dryland crops now have data to allow them to more confidently adjust their farming systems to accommodate both dryland and irrigated crops. Adjusting to 30inch row configuration will enable irrigators to move to machinery with wheel spacings of three meters, the spacing typically used in dryland cropping. Standardising wheel spacing across all equipment will reduce compaction and is important for producers pursuing true control traffic farming.

The trial confirms the importance of well-established bed structures and the need for significant lead time to enable new bed configurations to stabilise. The 1.5m beds used in the 30 and 60inch row configurations need to be established well in advance and the edges should be rolled to minimise slumping. Both sites found that where the bed structure was new there were significant issues with slumping and creating an evenly wet seed bed.

In conclusion the four trial sites have indicated that if growers intend to fully irrigate an area of cotton they would achieve better yields and WUE from either the 30 or the 40inch row configurations. However, this may not be the case in terms of optimising WUE under 30 or 40inch in a higher rainfall season or in higher rainfall environments. Irrigation of the wider row configurations is justified, but there will be significant yield penalties.



GVIA

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making every drop count

Keytah Data

[illegible]

Auscott Data 2014-2015

AUSCOTT COTTON ROW SPACING TRIAL RESULTS 2014/2015 (GINNED)																
Field	Ha's	Variety	Ha's Picked	Total Modules	Module Wt	Average Module Wt	Bales / Module	Total Bales	Average Turnout	TOTAL LINT WEIGHT	ACTUAL YIELD/HA	ACTUAL YIELD/ ACRE	Irrigation Water Applied (meg/ha)	Dec May Rainfall (ML/ha)	Total Seasonal Water	Seasonal WUE (bales/meg)
L1 30inch	5.22	Sicot 74BRF	5.22	15	31160	2077	3.92	58.8	42.8	13338	11.3	4.6	7.04	2.66	9.7	1.16
L1 40inch	5.22	Sicot 74BRF	5.22	18	39640	2202	4.09	73.6	42.15	16708	14.1	5.7	7.38	2.66	10.04	1.40
L1 60inch	5.22	Sicot 74BRF	5.22	14	31800	2271	4.15	58.1	41.49	13194	11.1	4.5	6.75	2.66	9.41	1.18
L1 80inch	5.22	Sicot 74BRF	5.22	13	27140	2088	3.74	48.7	40.72	11051	9.1	3.7	5.88	2.66	8.54	1.07
	20.88		20.88	60												
		Ginned Average	20.88						41.79		11.4	4.6	6.8			1.20

Auscott Data 2015-2016

AUSCOTT COTTON ROW SPACING TRIAL RESULTS 2015/2016 (GINNED)															
Field	Ha's	Variety	Total Modules	Total Module Wt	Average Module Wt	Average Turnout	Bales / Module	Total Bales	YIELD/HA	YIELD/ ACRE	Irrigation Water Applied (meg/ha)	WUE of Applied Irrigation Water (bales/meg)	Oct Mar Rainfall ML/ha	Total Seasonal Water per Ha	Seasonal WUE (bales/ML)
30 Inch	8	Sicot 74BRF	30	63100	2103	43.89%	4.07	122	15.3	6.2	7.14	2.14	2.42	9.56	1.60
40inch	8	Sicot 74BRF	31	63900	2061	43.82%	3.98	123.35	15.4	6.2	7.09	2.17	2.42	9.51	1.62
60inch	8	Sicot 74BRF	25	55860	2234	43.28%	4.26	106.5	13.3	5.4	6.03	2.21	2.42	8.45	1.57
80inch	8	Sicot 74BRF	22	47760	2171	42.44%	4.06	89.29	11.2	4.5	5.65	1.98	2.42	8.07	1.39
	32							441.15	13.79	5.6	6.5	2.13			

Auscott Data 2016-2017

AUSCOTT COTTON ROW SPACING TRIAL RESULTS 2016/2017 (GINNED)

Field	Ha's	Variety	Total Bales	YIELD/HA	YIELD/ACRE	Irrigation Water Applied (meg/ha)	WUE of Applied Irrigation Water (bales/meg)	Oct Mar Rainfall ML/ha	Total Seasonal Water ML/Ha	Seasonal WUE (bales/ML)
30Inch	12.8	Sicot 74BRF	147.05	11.4883	4.649214	7.96	1.44	2.83	10.79	1.06
40inch	12.8	Sicot 74BRF	144.52	11.2906	4.569224	7.28	1.55	2.83	10.11	1.12
60inch	12.8	Sicot 74BRF	122.9	9.60156	3.885675	7.17	1.34	2.83	10.00	0.96
	32	Average	138.1567	10.7935	4.368038	7.47	1.4444305			
Acres per plot	31.629									

Chasing water use efficiency in the Northern Basin

10 February 2017 - Edmund Hogan, NFF

On Wednesday, this week I had the opportunity to attend the Gwydir Valley Irrigator Association's Cotton Grower-led Irrigation Research Field Day in Moree.

It was the chance to witness firsthand the research trials being conducted on cotton crops this year, while also being able to talk to growers and those in the industry about the #MoreThanFlow campaign of which both NFF, GVIA and Cotton Australia are part.

It's good to be able to get away from Canberra and out into paddock once in a while, and the agricultural scientist in me welcomed the chance to take a look at the research on show. Trials investigating optimised row configuration and smarter furrow irrigation were paired with information on the latest in methods for remote control and autonomous irrigation. These trials are supported by research into how best to control traffic on farm as well as the development of new tools to aid in the decision making process of producers.

As seen out in the field, water users are constantly working towards greater levels of water use efficiency. Irrigators and farmers know the worth of a gigalitre (GL) of water and how to extract as much as they can from each drop they have. There are of course many drivers behind this. Whether it be as a result of the rising costs of farm inputs exerting economic pressures or the boom or bust environment in which we operate our farming systems, we have to find a way to make do. The innovative (and often competitive) nature of farmers means we are always working towards the same goal: How can the maximum result that can be achieved from the resources available?

And really, that's exactly what the [#MoreThanFlow campaign](#) is all about too.

It's a clarion call that the Government start working as hard as other water holders do in making sure every drop of their water counts.

278 GL of water has already been recovered from production in northern basin communities. This has been placed in the hands of the Commonwealth Environmental Water Holder and is dedicated to the purpose of improving the health of rivers, floodplains and wetlands. However, the results of the recent Northern Basin Review by the Murray-Darling Basin Authority (MDBA) show that the current 'just add water' approach to environmental management of the northern rivers is not working. Of the 43 flow indicator targets set by the MDBA to assess environmental outcomes in the north, 19 will not be met under any of the water recovery scenarios they tested.

To their credit, [the MDBA](#) has acknowledged this and highlighted the importance of implementing non-flow 'toolkit' measures in order to achieve better environmental outcomes. Disappointingly they also recommended that a further 42GL be recovered from productive use. However, the message back from northern basin communities is clear. When it comes to water recovery, enough is enough. The science is in and it's time to invest in the many non-flow options available to improve the health of the Murray-Darling, and not add further to the socio-economic pain caused by the Basin Plan through further recovery.

It's time to see if the Government can match irrigators and farmers in the effective and efficient use of their water resources.

Agree? Then take the opportunity to complete a quick and easy online submission to let the Government know that enough is enough when it comes to water recovery. [Click here to make your submission](#) #MoreThanFlow

NEWS

Grower-led research showcased

BY LAINI KIRKMAN

MORE than 120 people from as far as Burdekin down to Griffith and everywhere in between attended Gwydir Valley Irrigators Association (GVIA) annual field day on Wednesday.

Field day goers were treated to a number of speakers talking about different grower-led research into new innovations and technology for irrigation and other farm practices.

The large group visited two optimised irrigation trial sites at Auscott and Red Mill, just outside of Moree.

GVIA project officer Lou Gall said a row configuration trial at Auscott was first on the agenda.

"One of the key things that came out of that was the importance of looking at the set

up you have on your farm, ensuring your machinery fits with that and working towards making all the decisions that have the potential to maximise your water use efficiency, your nutrient use efficiency and your productive capacity."

She explained recent data suggested 30 inch or 40 inch pipes both produced good yields, but the 30 inch was more suited to a mixed cropping situation.

"The guys at Auscott have been working at looking at the different row configurations so they can actually adopt a true controlled traffic set of guide lines."

The crowd ventured to Red Mill for an afternoon of discussing new technology.

"Most importantly technologies that are going to aid in growers' efficiency."

Each presenter came with a wealth of knowledge and information on their tested technology, including a few farmers who'd agreed to test the innovative products first hand. "Watching everyone run to the bank to watch the Smart Syphons start was fantastic. It goes to show they are interested and they are looking at how they are going to put some of these technologies into their operations."

Ms Gall was pleased with the interaction of the huge cross section of irrigators, as well as the questions from crowd members.

"There is a lot to be done to move forward but in the next five to ten years its a really exciting space and we've got guys doing full automation and we've got really wonderful technologies being looked at."



WELCOME: Kirsty, Will and Tim Stevens call Mungindi their new home.

New minister for Mungindi

MUNGINDI'S Anglican Church has had their prayers answered.

After not having a residential minister since May last year, the position has been filled.

Tim Stevens will hold his first mass on Sunday and be inducted on February 19.

His induction will be performed by Bishop of Armidale Rick Lewers at 9am.

David Goodman, a member of the church for 40-odd years, was pleased to welcome a new, and young, family to the town.

"We're very thankful our prayers have been answered.

"We have a very loving community at Mungindi; about 20 regular people who attend Sunday mass."

Tim brings along his wife Kirsty and 18-month-old son Will.

The community is excited to make the new family feel welcome.

THE BORDER NEWS

CIRCULATING THROUGHOUT AUSTRALIA'S RICHEST AGRICULTURAL REGION

FREE

NEWS
COUNTRY
BATTLER



P3

NEWS
OFFSET
REVIEW



P4

NEWS
HAVE
YOUR SAY



P4



TRIED AND TESTED: Field day-goers compare Smart Syphons to traditional pipes at Red Mill, just outside of Moree, on Wednesday.

Smarter irrigation

Field day showcases innovative technology for region's growers

BY LAINI KIRKMAN

SMARTER irrigation was the theme of Gwydir Valley Irrigators Association's (GVIA) annual field day.

The popular event drew a crowd of 126 people from as far as the Burdekin, down to Griffith and everywhere in between, all interested in learning about grower-led research.

Auscott and Red Mill hosted the crowd, showcasing their trial sites.

GVIA project officer Lou Gall said Auscott's row configuration trial was first up on the agenda.

"One of the key things that came out of that was the importance of looking at the set up you have on your farm, ensuring your machinery fits with that, and working towards making all the decisions that have the potential to maximise your water use efficiency, your nutrient use efficiency and your productive capacity."

She said Auscott workers had been looking at different row configurations, to adopt a truly controlled traffic set of guidelines.

"We've got three sets of data from this trial and this is our fourth set.

"It's suggesting that the 30 inch, or the 40 inch, are both going to be water-use efficient and produce really good yields, but the 30 inch does fit better in a mixed cropping situation," she said. Red Mill offered field-go-

ers the chance to see different irrigation methods in practice, including the Smart Syphons.

"Watching everyone run to the bank to see the Smart Syphons start was fantastic. It goes to show they are interested and they are looking at how they are going to put some of these technologies into their operations," Ms Gall said.

Water level sensors were also being tried and tested at Red Mill, to alert the farmer

when water was too low, a bit high, or extremely high in the channels.

"There is a lot to be done to move forward, but in the next five to ten years it's a really exciting space and we've got guys doing full automation and we've got really wonderful technologies being looked at, that are going to benefit in the future," she said. Ms Gall said the event was an overall success.

"There was such good interaction from a cross-section

of irrigators that attended. All the presenters were asked some fantastic questions too, so it showed the crowd were interested in learning more about some of this innovation and new technologies."

The Federal Department of Agriculture and Water, and CRDC were thanked.

"Their funding is really important for us to continue doing this sort of research, so growers can see first hand how it's going to fit beyond a research perspective."

NEWS: RURAL HEALTH COMMISSIONER TO ADDRESS CONCERNS P6



GROWING INNOVATION: Growers attend last year's field day organised by the Gwydir Valley Irrigators Association.

Cotton field day spotlights innovation

THE Gwydir Valley Irrigators Association (GVIA) will host its annual irrigation field day on Wednesday, February 8.

This year, the field day will visit two optimised irrigation trial sites.

At Auscott, there is the Optimised Row Configuration trial, assessing the relative yield potential of a number of different row spacings under optimal irrigation.

At Red Mill, the Optimised

Furrow Irrigation trial includes examples of standard siphons, small pipe through bank siphons and smart siphons. "Grower-led research provides growers with a practical and commercial

assessment of new innovations and technology," GVIA project officer Lou Gall said.

Buses will leave the Moree Race Course at 7.20am and return by 2.30pm.

Local presence for NDIS in Moree

BY LAINI KIRKMAN

ST VINCENT de Paul's National Disability Insurance Scheme's Local Area Coordinator (LAC) office has been officially opened in Moree.

Funded by the National Disability Insurance Scheme (NDIS), the six employed LACs have already assisted 110 scheme participants transition.

Hunter New England senior operations manager Kellie Gilbert commended the Moree team and stressed how crucial it was to have a local office.

"We've just been joined recently by our Aboriginal local area coordinator, which is fantastic and we were lucky enough to attract an Aboriginal team leader (Dawn Blanch) for Moree.

"We do strongly believe that any of our participants that would like to work with an Aboriginal LAC should have the right to do so," she said.

She also acknowledge there was confusion around the scheme and the work of LACs.

"I simply say here we want to help people connect to the NDIS and once they do get there we want to help them get the most out of it," she said.

At the opening, Aboriginal engagement officer Owen Craigie said the society was developing a RAP (reconciliation action plan).

The plan includes a number of full-time jobs for Aboriginal people, an Aboriginal steering committee based at head office and a meeting for all Aboriginal staff.

"All Aboriginal staff can come together to talk about how we can grow and things we can do to move forwards.

"We've also established Indigenous ice-breaking tools when dealing with families to ensure questions are culturally appropriate."

Moree Plains Shire mayor Katrina Humphries and Federal Member for Dal-