CottonInfo Extension Activity Report

Part 1 - Summary Details

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

CRDC Project Number: **CSD1901**

CSD: **CSD1901**

Project Title: **CottonInfo Irrigation field days**

Project Commencement Date:12 Dec 2018 Project Completion Date:1st May 2019

Part 2 – Contact Details

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Part 3 – Final Report

(The points below are to be used as a guideline when completing your final report.)

Background

1. Outline the background to the project.

Australian cotton irrigators are looking at alternative irrigation systems that are labour, water and energy efficient. There is an increasing interest in siphon-less (bankless and pipe through the bank (PTB)) irrigation systems due to higher labour and machine operating efficiencies than siphon irrigated systems and lower energy requirements than pressurised alternatives. While these efficiencies have not yet been quantified through scientific research, there is much anecdotal evidence on improved efficiencies along with similar yields and water use to siphon systems.

Southern irrigators on bankless systems have attributed higher yields to improved early establishment. They have also stated that they believe they can achieve more successful early establishment with a bankless system than siphons especially with poor and problem soils.

Since the early 2000s many irrigators in the Murrumbidgee Valley have developed innovative layouts to reduce labour requirements associated with down the slope siphon systems. With row crop development into new areas in the southern valleys there is the opportunity to develop older irrigation systems (contour and border check) to more efficient irrigation layouts.

Field days were held in Griffith and Moree to showcase siphon-less irrigation systems.

Siphon irrigation still accounts for around 83 per cent of irrigated cotton production (CRDC Grower Survey 2018). The 2017/18 irrigation performance assessments conducted by CottonInfo have shown there is still room for improvement. In fact, 75 percent of the irrigation events measured had an application efficiency of less than 80 percent (industry standard for minimum performance). There are simple management practices that can lift irrigation performance. Training was conducted on-farm to share these practices with farm staff.

This project contributes to the CottonInfo Strategic Plan Goal 1: Improving rate and reach of adoption and adaptation of research and development; key focus area: New technologies and management practices adapted; and activity: Investigate and facilitate the development of beneficial new technologies, management practices and systems for cotton farms; progressing towards out 2023 target of 1.3 bales/ML (GPWI).

Objectives

2.List the project objectives (from the application) and the extent to which these have been achieved.

The Siphon-less Irrigation Systems Field days had the objective of showcasing the latest designs in irrigation layouts. These siphon-less layouts allow flexible water delivery, time, water and labour savings, potential higher yields for all crops in the rotation and automation. The project will share knowledge and experiences in design, operation and maintenance of siphon-less irrigation systems, providing a balanced assessment of both the strengths and weaknesses of the siphon-less systems.

Objectives include:

1)Increase awareness and understanding of main siphon-less Irrigation systems used in the Australian Cotton Industry. COMPLETE

2) Provide design guidelines/best design practice for growers embarking on a siphon-less development. COMPLETE. Growers had the opportunity to hear from growers and designers at the field days on various design guidelines. What we found was that every design is slightly different to cater for soil types, topography, field slopes, field slopes, flow rate capacity and system command. Pulling together best practice guidelines is not an easy task. Sam North's, NSW DPI, current project is establishing design guidelines for southern Basin Systems. Sam spoke at both field days. Description of various siphon-less systems have been collated in the field day booklet and design descriptions are provided for each case-study. Siphon-less system animations have been completed, and ready to be posted onto the CottonInfo website. An industry factsheet comparing the various siphon-less systems to siphon irrigation (in terms of

labour requirements, machinery efficiencies, tail water volume, green area, construction cost) is completed, this has been a collaborative effort between Glenn Lyons, CottonInfo, IAL Ltd, NSW DPI and USQ. (see Appendix 3).

3) Improve consistency of terminology associate with siphon-less designs. PARTIALLY COMPLETE. This was discussed at the siphon-less forum after the Northern Field day, but there was no consensus on terminology. There are Northern and Southern NSW terms for various components of a bankless system. A glossary of terms would be a useful document. The Cotton Industry should continue to work in collaboration with designers and manufacturers to develop such a glossary. In the meantime, the animations and case studies completed as part of this project describes the components of each siphon-less system.

4) Identify research gaps in siphon-less irrigation systems – COMPLETE

The Irrigation Application 101 training is farm staff focussed training to improve their understanding of water management at a field level.
Objectives include:
1) Increased understanding of best management practices to improve irrigation application efficiency and distribution uniformity- COMPLETE
2) Increased awareness of siphon size (metric vs imperial), siphon placement and effect on flow rate - COMPLETE
3) Increased understanding of irrigation performance measures such as application efficiency, requirement efficiency and distribution uniformity - COMPLETE.

Methods

3.Detail the methodology and justify the methodology used. Include any discoveries in methods that may benefit other related projects.

This project was an extension activity that involved peer to peer learning, visual demonstration, group learning and production of information resources.

The southern tour involved a bus tour that visited four farms to observe how these farmers and designers have made the transition to new layouts. Growers shared their experiences and discussed the benefits to their farming operation. Lessons learnt in the transition were highlighted so the new growers don't have to face similar mistakes to ensure a more productive system.

- Lunch and the afternoon forum allowed for interaction and questions to be answered.
- CottonInfo Technical specialist (Energy and Climate) Jon Welsh provided an example on economics of automation via teleconference.

The northern siphon-less field day was held at "Deer Park" Moree alongside a new siphon-less development with presentations from five growers and their irrigation system designer. Key Irrigation Researchers, Joseph Foley, USQ and Sam North, NSW DPI also attended and discussed what research has and is currently occurring and what we know and don't know about siphon-less systems and their performance. Investment decisions were presented by Phil Alchin, Boyce Chartered Accountants, and a panel session took place at the end of the day.

A small group of researchers, growers and designers met in the afternoon to pull together the outcomes of the day and key messages, and to discuss where to from here.

These field days were a collaborative event between CottonInfo, Gwydir Valley Irrigators Association, Local Land Services, Aquatech Consulting, Sapphire Irrigation, Irrigation Australia North West Regional Committee, NSW DPI, with funding from CRDC, NSWDPI STBIFM.

Three growers from the Macquarie Valley travelled to the Southern Field Day with Amanda Thomas, CottonInfo REO. As a result, the Smart Farm Demo Field Day was expanded to include a visit to a 5-year old siphon-less development, where growers could hear about the pros and cons and changes required to improve the efficiency of the system.

Two Irrigation Application 101 workshops were delivered in the Gwydir Valley. While it was planned for one for the Namoi Valley (total of 3 workshops), we were unable to garner any interest. The workshops were led by Jim Purcell, Aquatech Consulting who delivered a short informal refresher on irrigation practice to farm managers and their staff on the headditch of a field being irrigated. Siphon flow meters were used to show the impact on siphon size and placement on flow rate. The importance of maintaining a constant head of water in the head ditch, timing when siphons are pulled, impact of soil type, and field design on irrigation performance were all discussed.

Outcomes

2. Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

Planned Outcomes:

- **The Economic Benefits will be:** more productive irrigation farms
- **The Environmental Benefits will be:** more efficient use of water and land
- **The Social Benefits will be:** networking and long-term relationships between stakeholders

- Two siphon-less irrigation field days (North NSW, South NSW) and a pop-up farm walk in the Macquarie. A total of 318 people attended these three field days (63 Sth NSW, 143 Nth NSW, 112 Macquarie). They increased their knowledge and understanding of the different siphon-less designs, along with the benefits and challenges faced by growers who have already adopted a siphon-less system.

- Two Irrigation Application 101 Workshops in the Gwydir Valley. A total of 28 people attended the two workshops. They increased their knowledge of simple management practices that can improve irrigation application efficiency.

- A comprehensive evaluation was conducted at each field day and the Irrigation Application workshops (Appendix 1). The results presented in Appendix 2.

Summary of Field Day Outcomes

318 irrigators and consultants managing over 100,000 ha have a better knowledge and understanding of siphon-less irrigation layouts.

77% of the Northern field day participants indicated that they would do something differently as a result of what they had learnt at the field day, including:

- Continue to alter designs to suit customer needs
- Undertake further research

- Look at bankless over PTB
- Learn more about alternative siphon-less systems
- Look more closely at the flat grade options
- Design check bank out to 4m
- Watch the high performers
- Communicate to others
- Ask more growers and engineers before proceeding
- Reconsider bankless irrigation set-up
- Better information flow with designer
- Suggest trial areas and recommend assessing with consultants
- Encourage my boss to trial siphon-less
- Wider gate structures
- Put in a bit of GL Bay
- Consider bay irrigation
- More thought to flow rates vs bay width

Over 40 per cent of the Southern field day participants indicated they would consider some changes including:

- PTB (7 responses)
- Automation (5)
- Pontoon (launch pad) changes (4)
- Still processing changes (3)
- Terraced bankless (2)
- Improving soil structure of new development – gypsum and stubble retention.
- Increased flow rates
- Size of bays to suit water flow
- Smaller bays at top and bigger bays in middle of bankless.
- Flow rate calculation/furrow

Networking with experienced irrigators, researchers, designers and irrigation suppliers was a major feature at each field day.

- ***Two field day booklets were produced:***

1) Southern Irrigation Layouts Tour. An updated booklet with case studies of the four farms was available on the day and sent electronically to participants. These case studies have been made available electronically after the event to other irrigators. (Appendix 3)

2) Siphon-less Irrigation Field Day February 2019 (Northern Field Day). This field day booklet includes nine case studies from northern irrigation developments, including field day speakers siphon-less developments. This booklet is available electronically https://www.cottoninfo.com.au/publications/irrigation-siphon-less-irrigation-field-day-booklet. (Appendix 3)

   The case studies provide excellent detail on the following:

   - Various siphon-less designs
   - Key design parameters

- Information about why a certain design was chosen
- Why the move from siphons was made?
- What worked well and what was difficult to implement
- What would you do differently, and considerations going forward.

A very useful resource for any grower considering a change to siphon-less irrigation. A hard copy of the field day booklet was provided to all field day participants. To date there have been 58 downloads from the CottonInfo Website.

- ***Animations of three main siphon-less designs***, GL Bays, Rollover bays and Siphon-less with tail-water backup. Draft animations completed. These will be posted onto the CottonInfo website and promoted through CottonInfo REO's.

  These animations are a much needed resource for growers considering a change to siphon-less systems. Understanding exactly how a field is watered for different designs can be difficult. These animations will provide a simple visual for the key siphon-less designs.

- ***Five short videos*** focusing on why, how and what of siphon-less systems produced by Paul & Tonia Grundy/Sharna Holman QDAF. Footage has been captured, content transcribed and video run sheets produced. Once editing is finalised they will be posted onto the CottonInfo YouTube channel. One video is complete "Going bankless – a grower perspective https://www.youtube.com/watch?v=JRRC04aXDis&list=PLQy8KAPn-DyrDdVd--pzHPRBqMFa8Qnrv&index=3&t=0s.

  These videos will allow growers to hear direct from other growers who share their experiences in implementing a siphon-less irrigation system on their farm.

- ***A report to summarise key findings from the siphon-less field days***. A report has been collated and shared amongst CottonInfo REO's for publication in regional newsletters. An article on the Northern Field day was also published in the Irrigation Australian Journal and case studies have been published in the Australian Cotton Grower Magazine. There are many more opportunities to promote the key finding from these field days including:

    - Siphon-less system investment decisions - collaborative article with Boyce Chartered Accountants.

    - Siphon-less Irrigation - Glossary of terms.

- ***Identify gaps in the research. A list of research needs has been developed from the field days including:***

- Pay back analysis of layout changes
- Data on hills verses beds
- Infiltration rates, movement of N
- Waterlogging data
- Storage design/Pump information
- Soil type constraints- run length v soil type
- Cheaper technology

- Yield differences between layouts
- Limited information on layouts for southern growers
- Irrigating on steep grades
- Proper design guidelines
- Performance evaluation
- Compaction
- Earthmoving parameters
- Economic and efficient structure
- Solid data yield impacts and water use and $$ figures
- Impact on people, WHS risks. Also impact on community if we remove labour opportunities.
- Check that water run nitrogen works in bankless systems
- Maintenance of banks between bays (weeds)

Summary of Irrigation Application 101 Workshops

Outcomes

- 28 participants including 10 farm managers (with 18,600 ha irrigation development,) 8 farm staff, 5 consultants and 5 industry personnel have a better knowledge and understanding of simple management practices that can be implemented to improve irrigation application efficiency.

- 73% of participants indicated that they would do something differently as a result of what they had learnt at the field day, including:

    - *Re-emphasising the basics for an efficient irrigation application.*
    - *Look closer at flow rates. Fine tune application efficiencies*
    - *Check Siphon size, field length*
    - *Make sure all pipes are under water*
    - *Monitor heads, check siphon size*
    - *Keep watching out for automation opportunities*

- 100% of participants said they would recommend this workshop to others.

3. Please report on any

a) Feedback forms used and what the results were.

- Evaluation forms were collected from participants at the field days and Irrigation Application Workshops. Refer to Appendix 2 for results.

b) The highlights for participants or key learnings achieved

<u>Irrigation Field Days</u>

Southern Field Day Highlights

- Automation
- To see layout options on different farms
- PTB (Pipes through the bank)
- Different systems for soil types and slopes
- Hearing from practical people and networking
- Set up of pontoons (launch pads)
- Discussion on flow rates

Northern Field Day Highlights

- Grower presentations
- Investment decisions
- Update from researchers
- Information on different designs
- Researcher / grower / designer interactions and discussion

Key Learnings:

- Soil type and slope will drive your design.
- While there are 3 main designs used in the north, each one is unique to the farm, there will be differences in design depending on soil type, field slope, infiltration characteristic, flow rate.
- Growers who have adopted siphon-less irrigation are seeing labour savings and machinery efficiencies, some have reduced tail waters and all have a better lifestyle
- The questions surrounding these systems are about irrigation performance. It hasn't been measured, we don't understand properly the uniformity of application and what the losses are.
- Most believe there isn't a significant change in water use or yield.
- Flat designs – potential for drainage issues during wet periods.
- There is definitely less control of water compared to a siphon system
- Structures are costly
- Generally, reduce green area (although the % reported by growers varies).
- Complexity of the system means it pays to work with a designer.

<u>Irrigation Application 101 Workshop Highlights</u>

- IrriMATE flow meter demonstration

Key Learnings:

- Flow rate can vary significantly with small changes in head
- To maximise & maintain flow rate siphons should be discharging below the water level in the rottobuck area.
- Maintain the height of water in the head ditch to ensure even flow rate throughout the irrigation.
- Inflow rate typically has the largest influence of any variable that can be managed by the irrigator
- Time to cutoff is a key variable easily managed by the irrigator.
- Flow rate and time to cut-off should be managed together.

c) The number of people participating and any comments on level of participation

- Southern Field Day = 63 attendees
- Northern Field Day = 143 attendees
- Macquarie Pop-up = 112 attendees
- Total 318 participants

- The level of participation was high at all three field days, with participants highly engaged, asking plenty of questions and continued discussion in smaller groups during the breaks.

- Irrigation Application 101 Workshop = 28 attendees
  - The level of participation at these workshops was good, with participants engaged especially with the 'Siphon Flow Rate" demonstration where the IrriMATE siphon flow meters showed the change in flow rate with siphon size and placement.

- **Please refer to the evaluation reports for full details, Appendix 3.**

Conclusion

4. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

The Siphon-Less Field Days have been a successful building capacity event. 318 irrigators and consultants managing over 100,000 ha have a better knowledge and understanding of siphon-less irrigation layouts. There continues to be great interest in siphon-less irrigation, with irrigators wanting improved efficiencies, labour, water and machinery and also an improved lifestyle. While there is anecdotal evidence of these benefits the irrigation performance of siphon-less systems are still not proven. Despite the lack of comprehensive scientific data on irrigation performance, growers are going ahead with developments. Information resources developed from these field days will help irrigators make more informed decisions, they will be better equipped to ask the right questions of their designer and have learnt about the challenges early adopter have experiences, all valuable learnings for growers.

The field days are an example of how CottonInfo can connect growers, designers and researchers and provide an avenue for growers to learn about siphon-less irrigation systems.

The Irrigation Application 101 workshops provided an excellent refresher for irrigators on the simple management practices they can implement to improve irrigation performance. The IrriMATE flow meter is an excellent tool to demonstrate the impacts of some of these practices. An in-field toolbox meeting at the start of each irrigation, using an IrriMATE flow meter is a great way to ensure irrigators have a better knowledge of the principles behind siphon irrigation and how they can impact the irrigation performance.

Extension Opportunities

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

(a) To tell other CGAs/growers/regions about your project.

The following communication are completed: (Refer Appendix 3)

- A summary article about the field day and key messages has been distributed via CottonInfo Regional Newsletters.
- An article "Field day puts siphon-less irrigation under the microscope" was published in Irrigation Journal Australia, Autumn 2019.
- The siphon-less case-studies have been published in the Australian Cotton magazine.
  - "Top to bottom siphon-less irrigation", Feb-Mar 2019, Vol. 40, No.1
  - "Siphon-less with tail water backup", April-May 2019, Vol. 40, No. 2
- Post on GVIA Website https://www.gvia.org.au/community-and-industry-initiatives/industry-partnerships/siphon-less-irrigation/

- Facebook post Gwydir Valley CGA - February 6 2019 & February 7 2019.
- Moree Champion Newspaper article. Farmers from across the state come together for annual Gwydir Valley Irrigators Association Field Day, 7 February 2019. https://www.moreechampion.com.au/story/5891864/growers-share-knowledge-about-siphon-less-irrigation-photos
- Irrigation Application 101 Toolbox Talk resource pack - a factsheet that provides links to all the key irrigation application resources including video, fact sheets and case studies.

(b) To keep in touch with participants.

The designers are keen to keep in contact to continue discussion on best practice design guildelines and siphon-less terminology. Video conference or special interest groups within IAL Ltd are possibilities.

Participant contact details have been collected and they will be notified as the following resources are published:

- Siphon-less design animations
- CottonInfo Siphon-less videos
- Industry factsheet comparing the various siphon-less systems to siphon irrigation (in terms of labour requirements, machinery efficiencies, tail water volume, green area, construction cost).
- Irrigation Application 101 Toolbox Talk Resource Pack.

(c) For future projects.

- While no future projects are planned at this stage with siphon-less systems, depending on water availability, pop-up farm walks when siphon-less systems are being irrigated are a great way to ensure continued extension of siphon-less information to growers.
- myBMP module may include updates to siphon-less systems based on key messages established from the field days.
- Further Irrigation Application Workshops with relevant specialists eg Jim Purcell, Pat Hulme etc. As part of the CottonInfo Catchups or during on-farm visits, CottonInfo REO's should have access to an IrriMATE siphon flow meter to demonstrate impact of siphon size and placement on flow rate.

APPENDICIES

Appendix 1: Flyers and evaluation sheets

Appendix 2: Evaluation Reports

Appendix 3: Publications

APPENDIX 1
– Flyers and evaluation sheets

Siphon-less Irrigation:

learn from those who have made the change

Learn firsthand from growers and designers who have made the change to siphon-less irrigation.

Hear why they made changes, what designs they have used, what worked well, and how they addressed the challenges they faced in the development.

Irrigation researchers Malcolm Gillies (USQ) and Sam North (NSW DPI) will provide updates on the research that has taken place with these systems. How bankless systems work, where they are best sited, what soils they are best suited to, and other design recommendations.

Boyce Chartered Accountants will also be on hand to discuss what you need to consider when investing in a new siphon-less system.

Date:	Wednesday 6 February 2019
Time:	7:30am bus departure (Moree Racecourse), for 8:30am start
Venue:	Deer Park, Combadello Rd, Moree
RSVP:	Lou Gall, GVIA: 0427 521 498, lou.gall@gvia.org.au If you wish to drive yourself, directions are available on request.

This field day is brought to you by:

IRRIGATION AUSTRALIA North West NSW Regional Committee · GVIA · Cottoninfo · NSW Department of Primary Industries · NSW Sustaining the Basin Irrigated farm modernisation · NSW Local Land Services · CRDC · AQUA Smart Water

Siphon-less Irrigation: agenda

7:30am	*Bus leaves racecourse*
8:30am	Welcome and introduction - George Truman
8:40am	Background: What do we know about bankless? What don't we know? What research has occured? - Malcolm Gillies, USQ and Sam North, NSW DPI
9:00am	Grower and designer learnings - Gwydir: - Harry Cush and Bernie Martin, 'Deer Park' - Tom Cush and Bernie Martin, 'Avymore' - Richard Wright and Bernie Martin, 'Woodvale'
9:30am	Grower and designer learnings - St George: - Rob Jakins and Glen Lyons
9:50am	Grower and designer learnings - Goondiwindi: - Brett Corish and Peter Leeson, 'Mundine'
10:10am	*Morning tea*
10:30am	Investment decisions - Phil Alchin and Jono Hart, Boyce Chartered Accountants
10:50am	Researcher update - Sam North, NSW DPI
11:15am	Panel session - chaired by Jim Purcell, Aquatech Consulting
12:00pm	*Lunch*
1:00pm	*Bus returns to Moree Racecourse*

This field day is brought to you by:

Irrigation layouts: what are your options?

With a range of irrigation layouts available to Southern growers, CottonInfo is hosting an on-farm bus tour to view & discuss options.

Commencing at 8am at the Coleambally Community Club on Wednesday 12 December, the tour will visit four sites to observe different irrigation layouts, including bankless and pipe-through-bank, and discuss the positives and pitfalls with cotton growers.

The bus will return to Coleambally for lunch, followed by a question-and-answer panel session with growers. A tour booklet with detailed case studies will be provided on the day. Limited places are available on the bus (with no cars to follow): as such, RSVPs are essential.

Date:	Wednesday 12 December 2018
Time:	8am sharp for departure
Venue:	Coleambally Community Club
RSVP:	Kieran O'Keeffe, CottonInfo REO Southern NSW 0427 207 406, kieran.okeeffe@cottoninfo.net.au



CottonInfo is a joint initiative of CRDC CSD COTTON AUSTRALIA

Best Practice

SMART FARM SHOWCASE 2019

Thursday, 21 February

"KARAMEA" GIN GIN

8.30am to 12.30 pm

Morning tea and Lunch provided by our sponsors

- Grower focused evaluation of the latest 'smart farm' technology.
- Channel height, return channel and pump monitoring.
- Soil probes, irrigation forecasting, canopy temp sensors.
- Pump monitoring requirements and updates on patents.
- Water and fuel tank monitoring.
- Changes made to a bank-less system, 5 years old, making it more efficient.

RSVP : **18 February to Sophie O'Brien, MCGA: 0403 833 881, admin@mcga.org.au**

If you require directions or further information please contact Sophie.
Park cars at shed, a bus will take us on the farm tour.

Evaluation form: *Siphon-less Field Day, Deer Park. 6th Feb 2019*

Thank you for attending today's event. We value your time and would appreciate your feedback.

1) How would you classify yourself? Tick

Grower/Farm Manager ☐ Farm Staff ☐ Consultant ☐ Retailer ☐

Industry ☐ Other ☐_____

2) How much land do you have developed (manage, if consultant) for irrigation? _____ ha

3) How did you hear about this field day? Tick

Friend/family/other farmer ☐ Advisor ☐ IAL ☐ CottonInfo ☐ GVIA ☐

Other ☐ please specify_____

3) Do you currently have a siphon-less irrigation system on your farm?

☐ Yes, type of system_____☐ No

4) What was your main reason for coming along to this field day (tick all applicable)?

☐ I am about to convert to a siphon-less system

☐ I am considering converting to a siphon-less system

☐ Better understanding of the different designs available

☐ Better understanding of investment decisions regarding a change in irrigation layout

☐ Update on the research into siphon-less systems

☐ Other_____

5) What have been the highlights of today?

_____

6) What changes to layouts are you considering in the future and why?

_____

7) What are your research & development needs for siphon-less symptoms?

_____

8) Will you do anything differently as a result of what you've learnt today? ☐ YES ☐ NO

If yes, what?_____

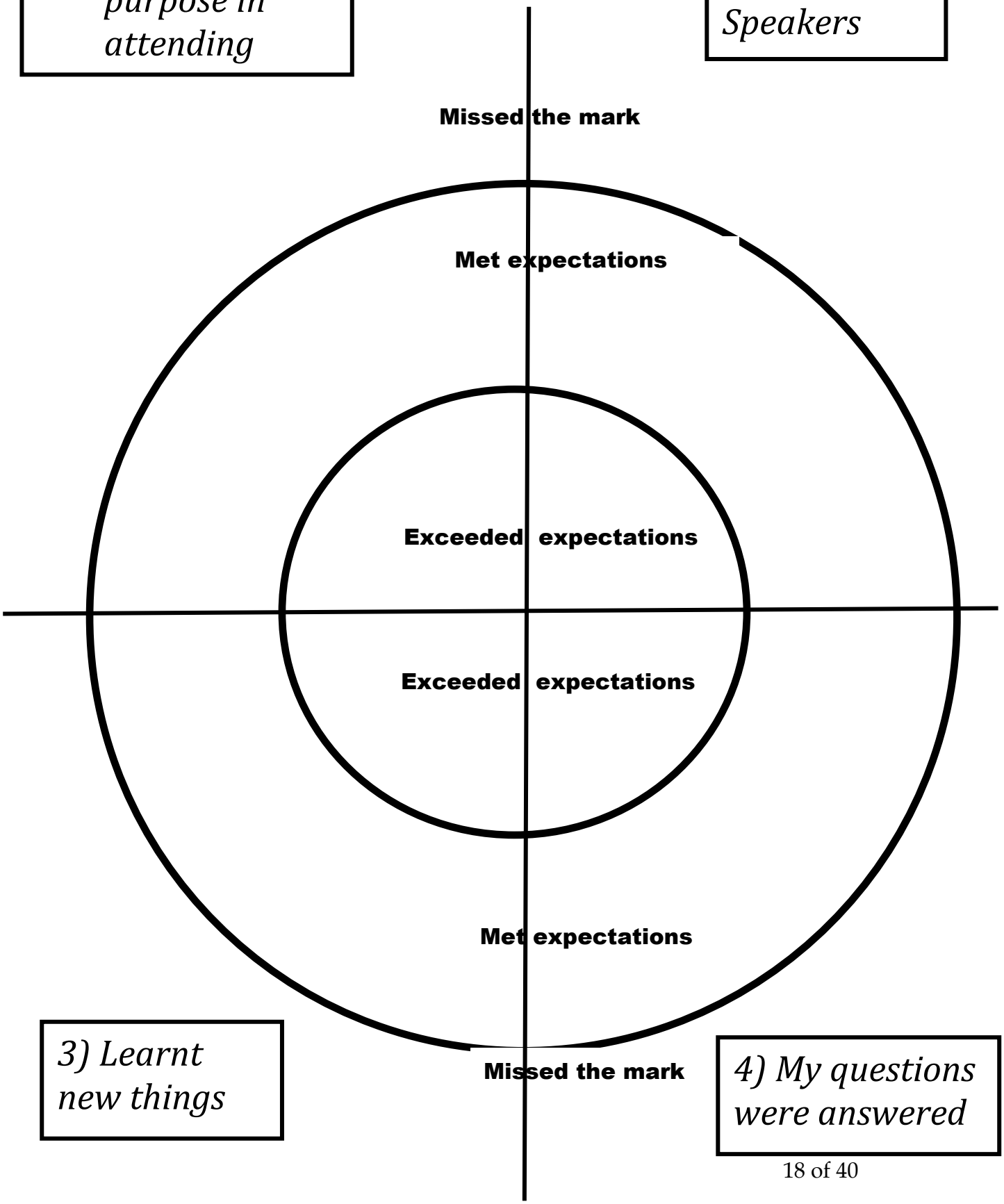
9) Any other comments_____

Dart Board Evaluation

Please mark a X on the dart board to show how you rate the <u>4</u> <u>questions</u>

1)Served my purpose in attending

2) Quality of Speakers



3) Learnt new things

4) My questions were answered

Evaluation form: *Irrigation Application Field Walk* *15th January 2020*

Thank you for attending today's event. We value your time and would appreciate your feedback.

1) How would you classify yourself? Tick

Grower/Farm Manager ☐ Farm Staff ☐ Consultant ☐

Retailer ☐ Industry ☐ Other ☐_____

2) If you are a grower or consultant, how much land do you have developed (if consultant, how much do you manage) for: a. irrigated cotton (ha) _____ b. dryland cotton (ha) _____

Delivery	**Disagree**				**Agree**
4) The field walk met your aims and expectations	1	2	3	4	5
5) The instruction received was of a high standard	1	2	3	4	5

6) The amount of information was: Tick

: enough information ☐ ɔut right ☐ › Much Information ☐

Course Content:	**Disagree**				**Agree**
7) The field walk was presented at a level you could understand	1	2	3	4	5
8) The topics covered were useful	1	2	3	4	5

9) How could we have improved the workshop to be more useful for you?

_____

10) Which of the following practices to improve irrigation application efficiency have you implemented on your (clients) farm (Tick all applicable)

- Check siphons make sure all same size: length and internal diameter…… ☐
- Use an irrigation sheet to record start and stop times of rows & sets……..... ☐
- Maintain a constant head of water in the head ditch……. ☐
- Placing siphons so they are discharging under water in rotobuck area……. ☐
- Manage flow rates and cutoff times to maximise application efficiency…….. ☐
- Conducted a Surface Irrigation Evaluation to check irrigation performance…….. ☐

11) Rate your level of understanding of management practices you can use to improve irrigation application efficiency

Before the course	1	2	3	4	5
After the course	1	2	3	4	5

12) Will you do anything differently as a result of what you've learnt today? ☐ YES ☐ NO

If yes, What?_____

13) Would you recommend this field walk to other growers and their irrigation staff? ☐ YES ☐ NO

14) Other comments_____ **Thank you**

APPENDIX 2: Evaluation Results

Southern Layout options tour Evaluation Summary
12th December 2018

Attended 63.
Responses 43. Growers 21, Consultants 2, Retailer 5, Other 6, Unspecified 9.

Main reason for attending

- To compare and see layouts on farm (17)
- To learn (10)
- Automation options (7)
- Options for development (5)
- Networking (2)

Highlights

- Automation (9)
- To see layout options on different farms (7)
- PTB (7)
- Different systems for soil types and slopes (3)
- Hearing from practical people and networking (2)
- Set up of Pontoons
- Discussion on flow rates

What changes are you considering?

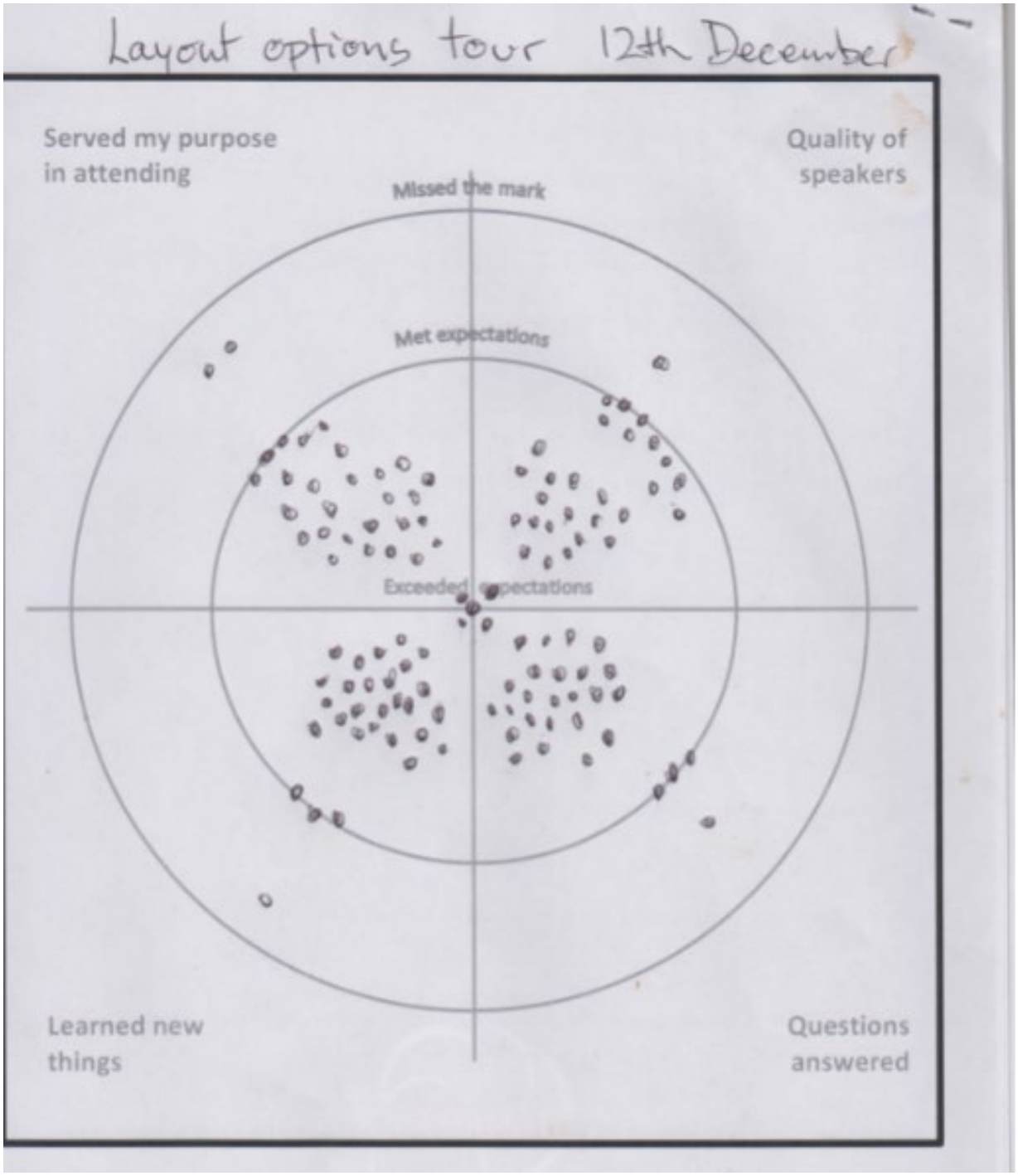
- PTB (7)
- Automation (5)
- Pontoon changes (4)
- Still processing changes (3)
- Terraced bankless (2)
- Improving soil structure of new development – gypsum and stubble retention.
- Increased flow rates
- Size of bays to suit water flow
- Smaller bays at top and bigger bays in middle of bankless.
- Flow rate calculation/furrow

Research gaps

- Pay back analysis of layout changes (4)
- Data on hills verses beds (2)
- Infiltration rates, movement of N
- Technology development – James Brinkhoff project
- Waterlogging data
- Storage design/Pump information
- Soil type constraints- run length v soil type
- Cheaper technology
- Yield differences between layouts

- Limited information on layouts for southern growers
- Irrigating on steep grades

Southern Field Day Feedback Dartboard:



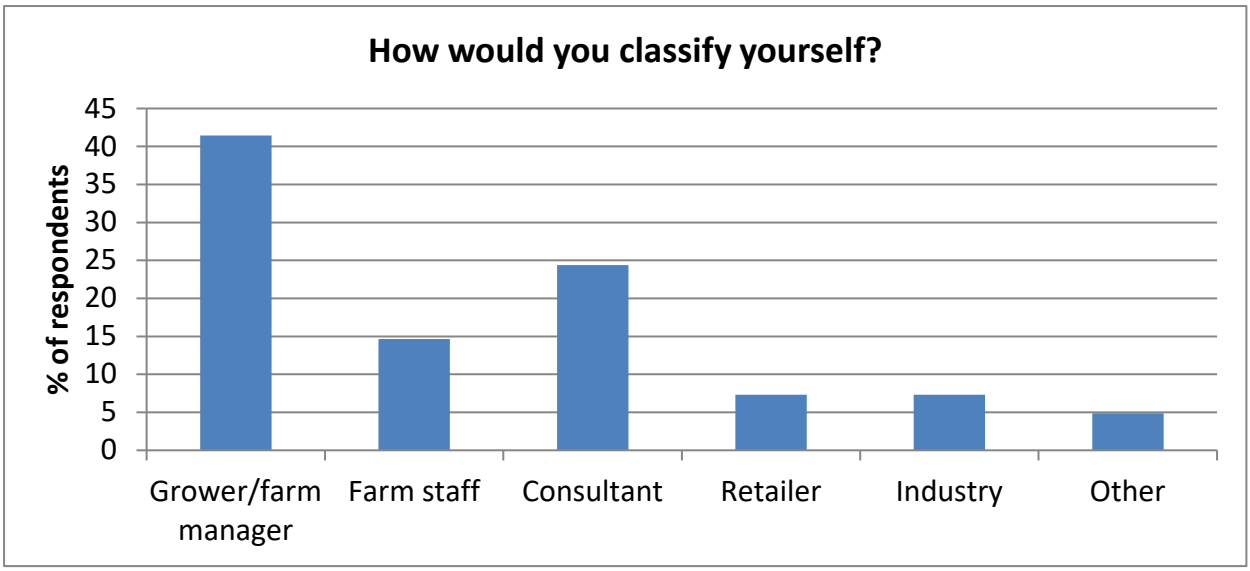
Northern NSW Siphon-less Field Day Evaluation

Number of responses 41

Number of participants 143

30% survey participation

1. How would you Classify yourself?



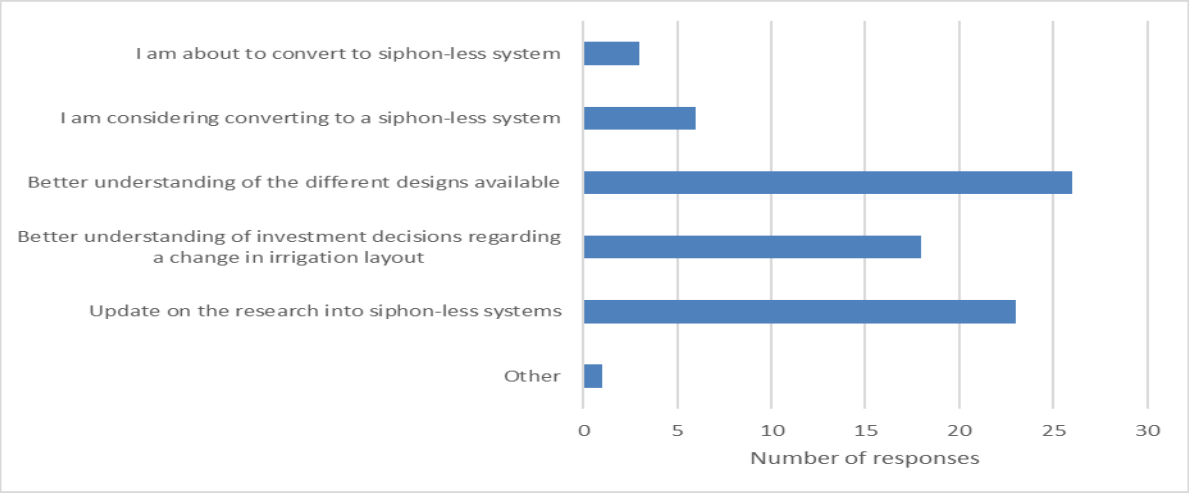
2. How much land do you have developed (manage, if consultant) for cotton irrigation (ha)?

Total	87230	ha
Min	100	ha
Max	10000	ha

3. How did you hear about the field day?

Friend/family/other farmer	7	15%
Advisor	8	17%
CottonInfo	12	25%
GVIA	14	29%
IAL	7	15%

4. Reason for coming along to FD



5. What have been the highlights today?

Panel	Updates on design parameters
Grower presentations	Grower comments
Grower talks	Good understanding
The extra information about the advances of siphon-less	Information presented
Range of speakers	Information
Farmer feedback	The different systems & how they work with topography & soil types & other limiting factors.
The number of different systems and can tailor to meet budgets	Openness of info on offer
Seeing diverse operations of siphon-less irrigation	No BS insight
Grower experiences & design	Information from irrigators using the tech
Phil Alchin's Presentation	Grower testimonials, practical advice
Understanding various irrigation systems, also getting a better understanding of our own irrigation system and how it could be improved	Information on various systems
Information on different designs	The different farms and designs
Willing exchange of information	Grower feedback and finance considerations
Hearing directly from the growers & the different designs in action. Special mention of WHS risk!	All good, but taking to people who have trialled various things
Seeing firsthand and seeing what other have	Range of irrigation systems
Look at designs and layouts, better idea of alternative options	Understanding uses
The gaps	Hearing from growers with bankless and designers
Free flow of information and learning	Decision making process
Researcher/grower/designer interaction & discussion	Case study presentations
Feedback from users of siphon-less	

6. What changes to layouts are you considering in the future and why?

Expect whole system change	Making easier
Slope changes in fields	Some version of siphon-less for labour reasons
2 fields currently not used due to inefficiencies, looking to change design	Bankless & Overhead Bankless for labour savings
Tail water management & automation	Siphonless trial to reduce risk exposure to WHS risk. Reduce backpackers & seasonal irrigators
All new development and major redevelopment to be siphon-less Siphon-less irrigation system implemented on the whole farm	More bays with beds in banks Doing some bankless development now, with developments suited to site topography
Convert more contour layouts to bankless basin	I think design criteria guidelines should be defined first

7. What are your research and development needs for siphon-less systems

Optimal design	Economic and efficient structure
Irrigation performance	Costs and designs
Land development/earthworks	Water efficiency
Proper design guidelines & Performance evaluation	Solid data yield impacts and water use and $$ figures
Whats the best system to suit irrigation and drainage Earthmoving parameters	Impact on people, WHS risks. Also impact on community if we remove labour oportunities
Compaction	Design/efficiency
Check that water run nitrogen works in bankless	Design Criteria
Measuring application efficiency and uniformity of application	Maintenance of banks between bays (weeds)
Yield and water use	

8. Will you do anything differently as a result of what you have learnt at this event?

Yes 77 No 13 Not sure 10.00

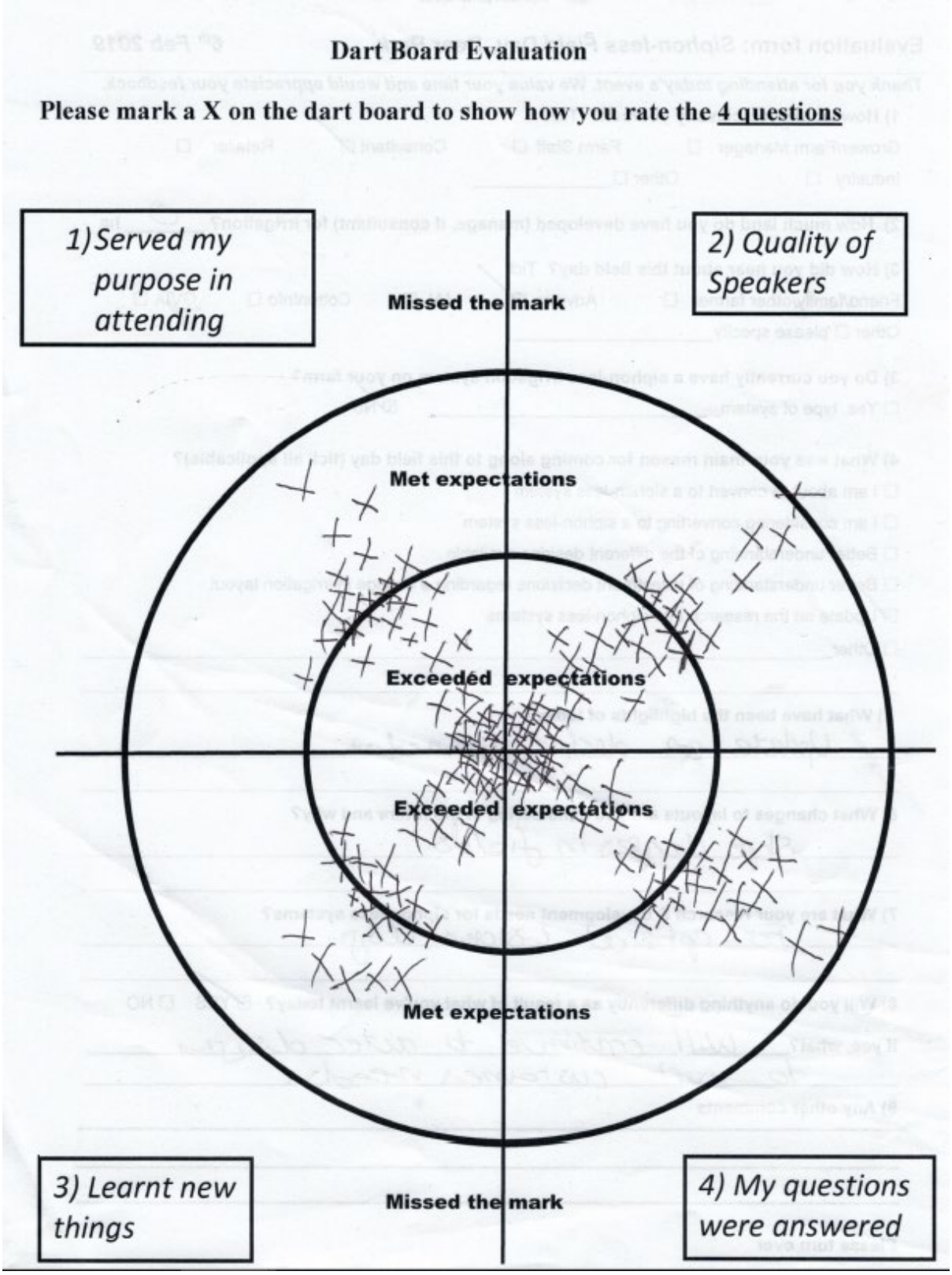
Will continue to alter designs to suit customer needs	Learn more about alternative siphon-less systems
Undertake further research!	Look at bankless over PTB
Look more closely at the flat grade options	Check bank design out to 4m
Watch the high performers	Communicate to others
Ask more growers and engineers before proceeding	Suggest trial areas and recommend assessing with consultants
Better information flow with designer	Reconsider bankless irrigation set-up
Encourage my boss to trial siphon-less	Wider gate structures
Put in a bit of GL Bay	Consider bay irrigation
More hope that siphon-less will go	More thought to flow rates vs bay width

9. Further comments

- More multiple choice questions!
- Good day
- Siphons aren't that bad until you lose them
- Great day and very informative

- Excellent as always, well done.
- Fantastic event, well organised & well attended! Would like more financial info, what are the costs of converting. Phil was great! I wanted more!
- Great day, Lou is fantastic!
- Well run field day. Well done, case studies excellent, complimented by researchers and consultants, excellent. Great food!
- Look at what farmers are thinking and what assistance/equipment they require.

10. Northern Siphon-Less Field Day Dartboard.

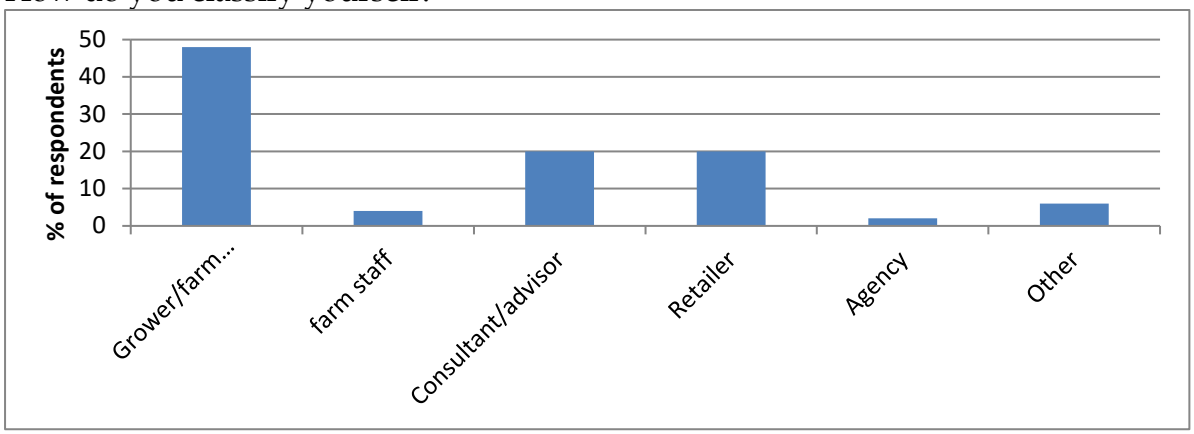


Macquarie Pop-up Bankless Farm Walk

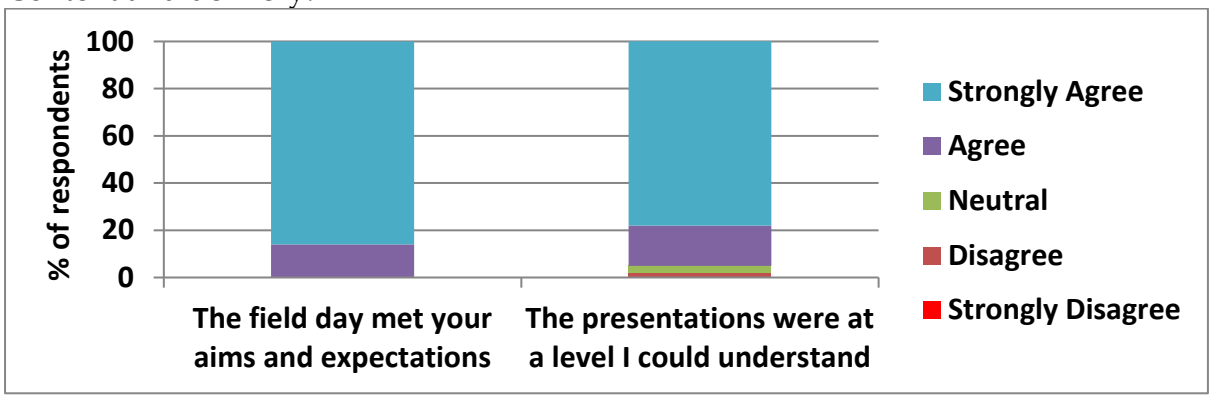
Thursday, 21 February

Demographics:
Attended 112.
Responses 52 Growers 24, Farm Staff 2, Consultants 10, Retailer 10, Agency 1, Other 3.

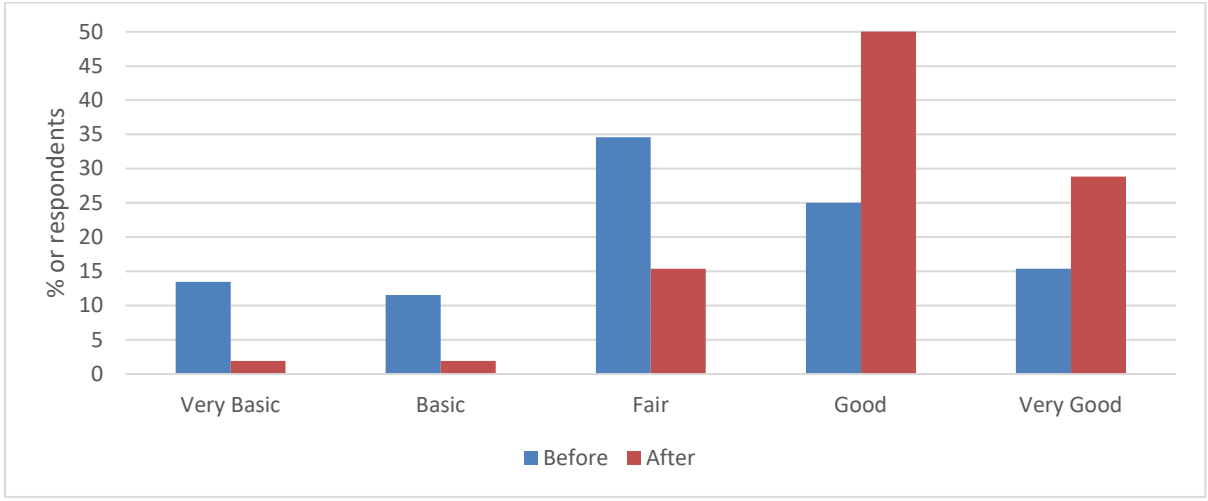
How do you classify yourself?



Content and delivery:



Change in understanding:
Rate your level of understanding of bankless irrigation (where 1 is basic and 5 is very good)



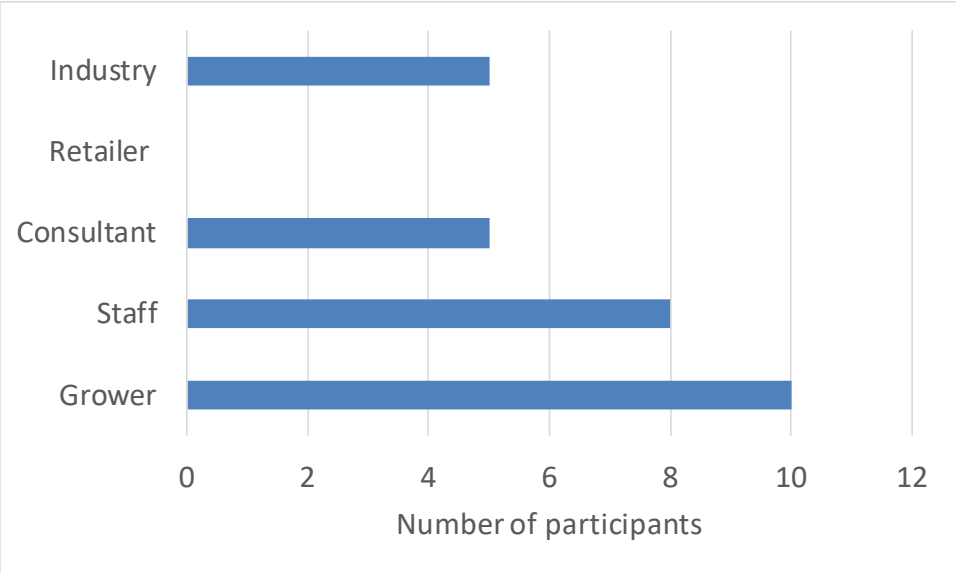
Irrigation 101 Workshops

Number of responses 11

Number of participants 28

39% survey participation

1. How would you Classify yourself?



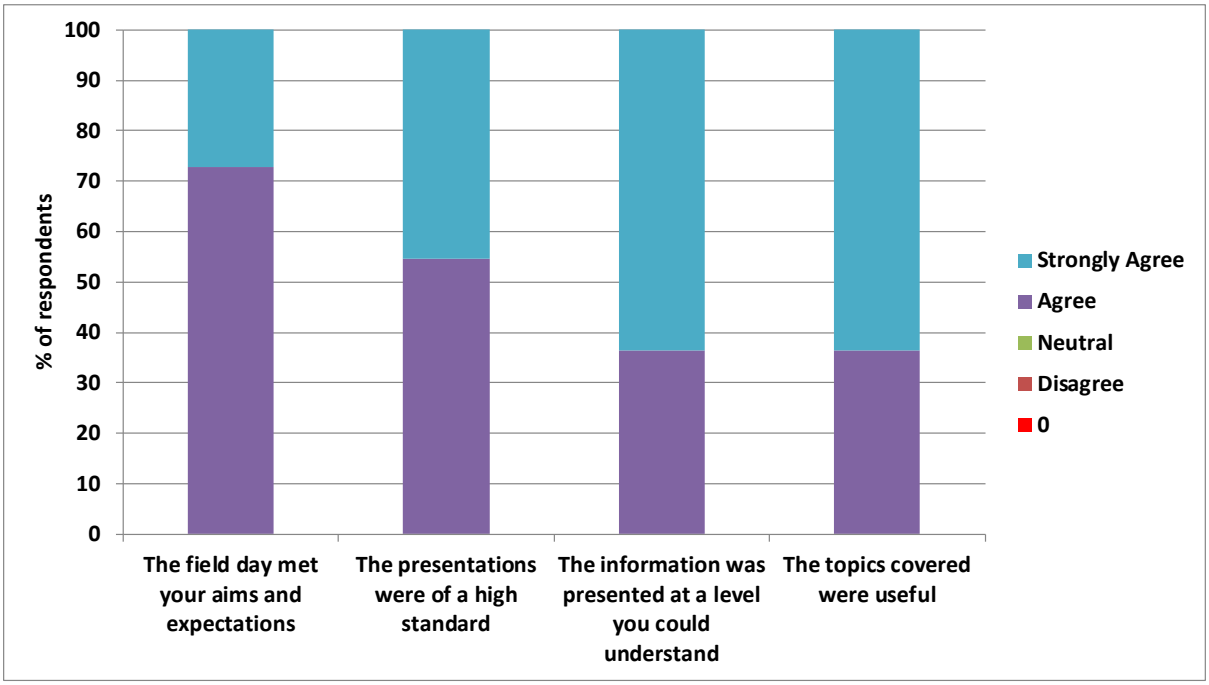
2. 2. How much land do you have developed (manage, if consultant) for cotton irrigation (ha)?

Total 18,600 ha

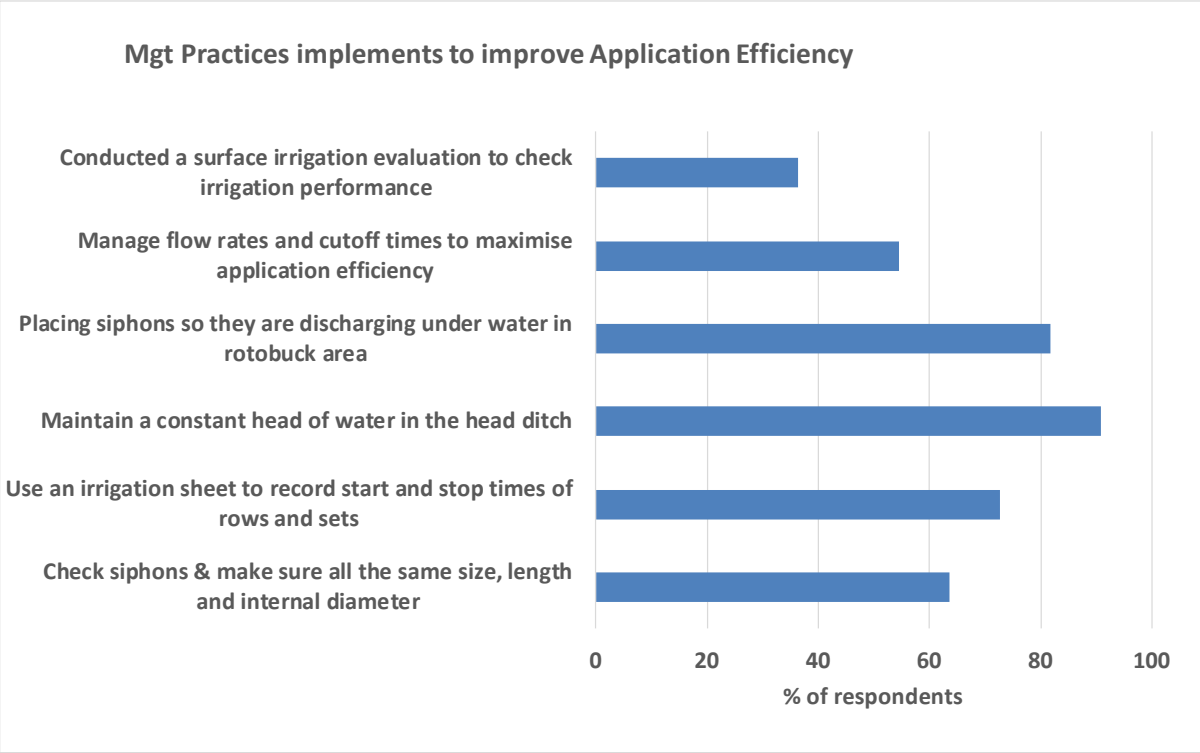
Min 800 ha

Max 6000 ha

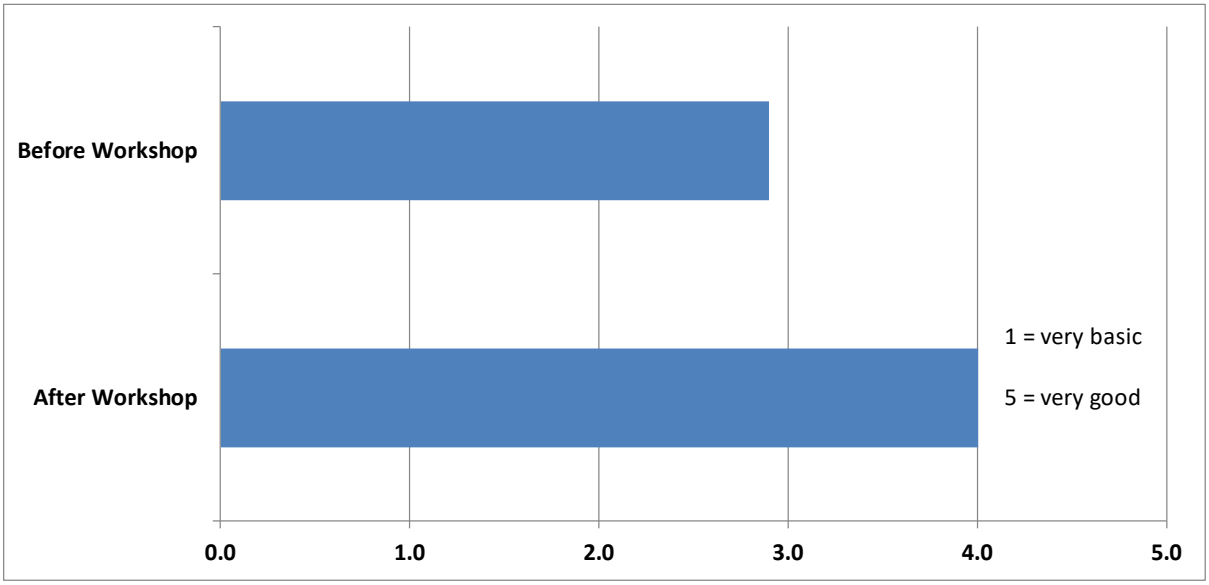
2. Workshop content and delivery



3. Which of the following practices to improve irrigation application efficiency have you implemented on your (clients) farm



4. Your level of understanding of management practices you can use to improve irrigation application efficiency



5. Will you do anything differently as a result of what you have learnt at this event?

Yes 73% No 27%

Re-emphasise the basics
Look closer at flow rates. Fine tune application efficiencies
Siphon size, field length
Make sure all pipes are under water

Monitor heads, check siphon size
Keep watching automation

6. Would you recommend this workshop to other growers and their irrigation staff?

Yes 100% No 0%

APPENDIX 3 – Publications

Draft publication: comparison of siphonless systems to siphons – Glenn Lyons, St George.

Benefit compared to Hand Siphon System	90mm Horizontal Siphons	Siphonless PTB's 250-900mm	Siphonless with Tailwater Backup	Bankless Head Ditch 'GL Bays'	Bankless Head Ditch 'Rollover'
Removed hand siphons	-100%	-100%	-100%	-100%	-100%
Removed rotobucks	No Change	-100%	-100%	-100%	-100%
Reduced tailwater	No Change	+100%	-70%	-70%	-80%
Reduced Silt	No Change	+100%	-70%	-70%	-80%
Reduced trash in tailwater	No Change	No Change	-70%	-70%	-80%
Application time is minimised	8-12 hrs	8-10 hrs	6-8 hr	6-8 hr	6-8 hr
Labour reduced	-80%	-90%	-90%	-90%	-90%
Stormwater runoff time improving crop yield	No Change	No Change	Yes	Yes	No Change
Machinery passing through multiple fields	No Change	No Change	No Change	Yes	Yes
Improved machinery efficiency	No Change	+10%	+10%	+20%	+20%
Water Consumption	No Change	-5%	-10%	-10%	-10%
Fertiliser Utilisation	No Change	More Lost	Less Lost	Less Lost	Less Lost
Green Area	No Change	No Change	-5%	-5%	-10%
Construction Cost including Automation($/ha)	$1,200	$1,500	$1,500	$3,000	$3,000

CottonInfo **Information** *when you need it*

the gwydir grower

In case you missed it....

Siphon-less Irrigation Field Day, Deer Park

North West Irrigation Australia (IAL) Regional Committee joined forces with GVIA and CottonInfo last Wednesday and held a field day to look at the range of Siphon-less irrigation systems in place in the Northern cotton valleys. Thanks to the Cush family for hosting the event and show casing their new siphon-less developments. Over 140 people attended the day. We heard from growers Harry & Tom Cush, Richard Wright and Brett Corish, Designers Bernie Martin, Peter Leeson and Glenn Lyons, Reserachers Joe Foley, USQ and Sam North, NSW DPI. Phil Alchin, C&W Accountants also provided some great information on investment decision when considering a system change.

Some of the key messages out of the day were:

- **Soil type and slope will drive your design.**
- **While there are 3 main designs used in the north, each one is unique to the farm, there will be differences in design depending on soil type, field slope, infiltration characteristic, flow rate.**
- **Growers who have adopted siphon-less irrigation are seeing labour savings and machinery efficiencies, some have reduced tail waters and all have a better lifestyle**
- **The questions surrounding these systems are about irrigation performance. It hasn't been measured, we don't understand properly the uniformity of application and what the losses are.**
- **Most believe there isn't a significant change in water use or yield.**
- **Flat designs – potential for drainage issues during wet periods.**
- **There is definitely less control of water compared to a siphon system**
- **Structures are costly**
- **Generally reduce green area (although the % reported by growers varies).**
- **Complexity of the system means it pays to work with a designer.**

NWIAL are working on a document to summarise all the findings from the field day.

A field day booklet was produced and is available at here on the GVIA website. GVIA also provides a great wrap-up about the day.
The Moree Champion also feature a story with some great photos here.

Darling Downs

Siphon-less Irrigation Field Day, Moree

North West Irrigation Australia (IAL) Regional Committee joined forces with GVIA and CottonInfo earlier this year and held a field day to look at the range of Siphon-less irrigation systems in place in the Northern cotton valleys.

Some of the key messages out of the day were:

- Soil type and slope will drive your design.
- While there are 3 main designs used in the north, each one is unique to the farm, there will be differences in design depending on soil type, field slope, infiltration characteristic, flow rate.
- Growers who have adopted siphon-less irrigation are seeing labour savings and machinery efficiencies, some have reduced tail waters and all have a better lifestyle
- The questions surrounding these systems are about irrigation performance. It hasn't been measured, we don't understand properly the uniformity of application and what the losses are.
- Most believe there isn't a significant change in water use or yield.
- Flat designs – potential for drainage issues during wet periods.
- There is definitely less control of water compared to a siphon system
- Structures are costly
- Generally reduce green area (although the % reported by growers varies).
- Complexity of the system means it pays to work with a designer.

A comprehensive field day booklet was produced and is available at this link.
https://www.gvia.org.au/community-and-industry-initiatives/industry-partnerships/siphon-less-irrigation/Irrigation-Guide_2019-NEW-Exec_4.pdf

Gwydir Valley Irrigators Association Inc
February 7 ·

Water availability might be low but it was an amazing turn out with great content and wide-ranging discussion about alternative irrigation options.

We are proud to help the whole industry remain focused on pushing new innovations and growing the most efficient crops we can 👍

Well done to everyone involved including Lou Gall, Janelle Montgomery, George Truman, North West Local Land Services, Irrigation Australia, Gwydir Valley Cotton Growers Association, Centre for Agricultural Engineering, the Cush Family, Boyce, CottonInfo and CRDC

MOREECHAMPION.COM.AU

Growers share knowledge about siphon-less irrigation | Photos

Gwydir Valley Irrigators Association Inc is 📅 attending Siphon-less Irrigation Field Day at Deer Park.
February 6 · Moree, NSW ·

What a great roll up today and excellent discussion at the siphon-less irrigation field day, with 140 farmers, researchers, designers and agros talking about alternative irrigation options.

With zero allocations, carryover exhausted and no rain in sight, we're proud to help the whole industry remain focused on pushing new innovations and growing the most efficient crops we can 👍

Well done to everyone involved including Lou Gall, Janelle Montgomery, George Truman, North West Local Land Services, Irrigation Australia, Gwydir Valley Cotton Growers Association, Centre for Agricultural Engineering, the Cush Family, Boyce, CottonInfo and CRDC

7:27 3G

Tweet

GVIA
@GwydirValley

Busy day in the #Gwydir great field day talking future innovations in irrigation with researchers, designers and growers, followed with a drought crisis meeting with no good news for anyone #justanotherdayintheoffice

GVIA and 8 others

4:28 pm · 6/2/19 · Twitter for iPhone

Tweet your reply

20

Macquarie bale up

MCGA FIELD DAY

At the beginning of the 2018/2019 season the Macquarie Cotton Growers Association put in a "Grass Roots Grant" to the CRDC (Cotton Research and Development) with the aim of having a look at all this "smart farm stuff ". Stu Denston, Sinclair Steele and Tim Gainsford and I went on a reconnaissance trip down South to the "Automation" field day in Griffith. We saw some great technology and innovation with some farms that can fully automate irrigations, however we did come away thinking that the key to adopting this technology is to find local service providers. With this in mind we decided to start at the beginning and look around for some sensoring options. Last season we worked with Goanna Ag to put in 8 inversion towers on existing weather stations and give all farmers access to the weather stations, they were currently rolling out a new technology in the valley using LoRaWAN gateways (currently there are 7 in the valley and another 2 will be going up soon). LoRaWAN is designed to capture and send small packets of sensor data on a low frequency that uses less power. We also partnered up with Porosity Ag Services in this project. The aim was to trial the suite of tools on farm and get a warts and all view of technology.

The on farm trial used the LoRaWAN gateway and has sensors for fuel and water tank monitoring , soil probes, AWS weather station, channel height sensors, sensors on mace meters, canopy temp sensors. Stu Denston manages 3 farms with some distance in between them. Having the sensors in place means he can have information every 15mins on what percentage a channel is full , or how much Diesel is in the tank. "It has been great with monitoring our bore water tank that feeds our cattle troughs, with the hot weather we have been having, I need to know there is an issue as soon as possible , not when the tank runs dry". "Stu commented that having the farm workers have access to this info has helped immensely especially in storms and irrigation situations, to know the pump is still going without have to drive through the mud at 4am is a game changer".

The MCGA decided to hold a field day to showcase this technology and get the "remote management experience" from Stu. It must have stuck a cord because we had 112 people turn up to this showcase. The day was split into two sections, the morning session was hearing from the providers and then plugging in the lap top and seeing what the software side of it looks like, with Stu taking us through each of the sensors he has in place. We then went out on farm to look at the sensors. The other focus of the day was to look at a Bankless field that is five years old, they are making some changes and were happy to share this with everyone so others who are interested in Bankless would be more informed about some of the challenges in getting the design right.

FIELD DAY PUTS SIPHON-LESS IRRIGATION UNDER THE MICROSCOPE

In February, the North West Branch of Irrigation Australia partnered with Gwydir Valley Irrigators Association, North West Local Land Services, Department of Primary Industries, Cotton Research and Development Corporation, CottonInfo and NSW Sustaining the Basin to host a siphon-less irrigation field day. Many growers in the industry are looking at siphon-less alternatives to address challenges such as labour resourcing, water and energy efficiency and productivity gains.

The field day, held at "Deer Park" at Moree on 6 February, brought together growers, designers and irrigation consultants who have firsthand experience with the various systems in the industry today. The event was an outstanding success with over 140 attendees who were able to discuss their needs and experiences with growers, designers and researchers.

The aim of the day was to hear from irrigators who have already installed siphon-less irrigation and who could share their experiences, including what worked well and what they would change. As well as talks by growers, the day included presentations by their designers and several case studies.

Some growers and designers have been working with siphon-less channel designs for many years while others have only recently tried these systems. The field day gave everyone a chance to get together and discuss what they have learnt from installing and using the different siphon-less or bankless channel designs. There was also plenty of time for people to talk and share experiences and the day finished with an open panel session with all speakers.

Sam North from NSW DPI addresses the field day on siphon-less irrigation. *Photo courtesy NSW DPI.*

More than 140 people attended the field to hear about grower experiences with siphon-less irrigation. *Photo courtesy NSW DPI.*

Assessing whether to install siphon-less

There are many reasons that growers may consider a siphon-less system, and this varies by farm – some growers are looking for water use efficiency, others for energy savings or productivity gains, while others are looking for a way to manage the challenge of labour resourcing, removing the need for casual staff while improving the sustainability of employment for permanent staff.

Whatever the reason, it should be remembered that this is a relatively new irrigation system. Any decision about changing over to siphon-less needs to be considered in the same way as an irrigator would assess the benefits of any irrigation system, including area of land, slope of the fields, soil type, water availability, existing infrastructure, available labour and the amount of earth works that the grower is prepared to do.

Positive feedback

The feedback from the day was very positive, many people commenting that it was one of the best field days they had attended. They said that it was great to hear from other growers and they were impressed that everyone was very open in sharing their thoughts and ideas. As well, it was great to see a group of industry organisations come together to co-host the event.

There was a session in the afternoon for researchers and designers to get together and reflect on the morning discussion. Here they looked at what is well understood about these systems, what are the considerations for those looking to install the siphon-less system, and where the knowledge gaps are. Outcomes from this session will help target research activities and look at opportunities to understand these systems.

Information

If you want to find out more about the field day and siphon-less irrigation, there is a comprehensive summary of case studies on how growers have implemented the various designs, why they made the investments and what their experiences have been on the Gwydir Valley Irrigators Association website, https://www.gvia.org.au/community-and-industry-initiatives/industry-partnerships/siphon-less-irrigation/

CottonInfo **Information** *when you need it*

the gwydir grower

20/12/19

In case you missed it……

10/12/19 Improving irrigation application efficiency

Jim Purcell met up with around 10 irrigator and consultants at 'Beela' to discuss how to optimise our irrigation application efficiency. How to refill the profile and keep the water in the root zone and not have it lost to deep drainage or excessive tail water.

We had a siphon flow meter and looked at the impact siphon placement had on flow rate. In our demo when the 63mm siphon was submerged the flow rate was 3.4 L/s, but when it was pulled out about 15cm, the flow dropped to 2.5L/s. If siphons all discharging at different heights, it will affect the evenness of water application across the field. Due to the lay of the land, the head can also vary from one end of the head ditch to the other, and can potentially cause a significant variation in flow rate.

Do you know your flow rates?
I have a couple of siphon flow meters that you can borrow to check flow rates and volume of water applied, give me a call if you would like to use them.

Did you know that the second largest loss of water on an irrigation farm is in the field. Second only to storage losses.

Some measurement is needed to optimise performance of an irrigation event. If you are interested in assessing irrigation performance, let me know or give Jim Purcell a call at Aquatech Consulting.

There are some simple management practices that can help irrigation application efficiency including:

Head ditch

- Consistently deliver sufficient water at an appropriate head;
- Maintain a constant flow rate;
- Maintain adequate freeboard (minimum of 0.15 m)

Siphons

- Siphon placement has a significant influence on flow rate as its placement will determine operating head. To maximise head and therefore flow rate the siphons must operate under submerged flow conditions, ie discharge under water level in between the roto bucks;
- Siphon size – check internal diameter and length. It should be the same. Imperial sized siphons are specified according to their internal diameter and metric siphons according to their outside diameter. Internal diameter of metric siphons vary between manufacturers – mixing these pipes causes variation in flow rate and can have significant affect on total water applied over an irrigation;
- Careful rota buck placement. The person starting the siphons should build the rota bucks as they are the individual on the shovel if there are any breakouts.

Water Application

• Manage flow rate and cutoff times to maximise application efficiency and distribution uniformity to reduce runoff, deep drainage and loss of nutrients;

• Inflow rate typically has the largest influence of any variable that can be managed by the irrigator. It has a major impact on performance due to the speed of water advance down the field. A faster advance is typically more desirable on high infiltration soils;

• Along with inflow rate, time to cutoff is a key variable easily managed by the irrigator. In fact, it is typical for these two variables to be managed together. Increased inflow rate is likely to result in excessive tailwater unless time to cutoff is managed accordingly;

• When inflow rate is increased, more precise control is typically required as it becomes easier to adversely affect performance when the inflow rate is high.

Further information

CottonInfo Factsheet: Key factors in improving furrow irrigation

CottonInfo Casestudy: Economic benefits of performance evaluation

Field Day Booklets

- Southern Layout Tour Booklet (Attached)

- Siphon-less Irrigation - Field Day February 2019 (Moree) https://www.cottoninfo.com.au/publications/irrigation-siphon-less-irrigation-field-day-booklet