

Rural R&D for Profit Programme

“Smarter Irrigation: “Optimised Dairy Irrigation Farms” Final Report

Dairy Australia

July 2015 – May 2018

Monique White



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This publication is available at agriculture.gov.au/publications.

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Acknowledgements

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Plain English summary

“Smarter Irrigation: Optimised Dairy Irrigation Farms,” successfully demonstrated farm profit on Australian dairy farms can be increased by \$20,000 - \$60,000/business through more effective irrigation scheduling and delivery. Participating farms significantly increased dry matter production and reduced energy usage per mega litre of water applied. Associated environmental benefits were reduced deep drainage and evaporation.

Through the use of a participatory applied research approach the project identified potential barriers to adoption of best practice and strategies to overcome these. The outputs of the project include increased industry expertise together with a range of dairy relevant irrigation tools and information resources. These outputs provide a significant legacy to support future industry irrigation extension activities.

Project methodology

The project was based around five optimised dairy irrigation demonstration farms located in NSW, SA, Queensland, WA and Gippsland. Baseline data was collected from each site and this information was used to implement improvements targeted at optimising irrigation potential.

The demonstration sites were supported by reference groups made up of researchers, farm consultants, industry service providers and farmers. These groups were responsible for identifying regionally relevant strategies to optimize water and energy use. Each reference group prepared a local demonstration program that reflected local needs while also encompassing national objectives and priorities.

The initial benchmarking activity identified inefficiencies in pumps, irrigation scheduling and irrigation delivery across all sites. Activities at all sites focused on resolving these inefficiencies whilst optimising irrigation outcomes. The project found that farmers identified as high performers can easily fall well below target irrigation efficiency benchmarks as a result of other priorities taking attention away from irrigation. For example, on dairy farms irrigation start-up often coincides with calving.

“Smarter Irrigation” demonstrated that getting the basics right and keeping up ongoing maintenance can provide substantial efficiency gains. Whilst system performance checks can identify the opportunity for significant improvements and potential cost savings they need to be undertaken regularly.

Over the course of the project 16 field days, 9 professional development workshops and two study tours were conducted. All activities were well attended with more than 750 people participating in events over the life of the project.

A wide range of regionally focused communication materials were produced by the demonstration site leaders. These were distributed through regional newsletters, industry networks and relevant websites. Examples include the Dairying for Tomorrow website which has a dedicated webpage showcasing progress reports and extension materials for each site. The Smarter Irrigation for Profit facebook and twitter presences have also been regularly updated to provide a communication channel for each of the regional sites.

A key output from the project is a national resource document, “Irrigation Best Management Practices for the Australian dairy industry”. This document draws on the learnings from the project to inform both the content and the cases studies.

Key Messages

Dairy farmers find focusing on irrigation efficiency challenging. Animal welfare and other activities such as milking and pasture rotation can often take precedence over irrigation decisions resulting in irrigation productivity losses that are not easily noticeable but have significant impacts on farm profit. The development of automated irrigation support software and data systems provides a significant opportunity to reduce the farm decision making related to irrigation however these systems must still address the farmers desire to have final control.

Until such farm irrigation management systems are readily available to all irrigators a focus on the basics of irrigation (understanding Readily Available Water, scheduling, measuring productivity and benchmarking performance) and targeted implementation support is essential to achieve improved irrigation productivity. Any program designed to improve performance must include regular and ongoing support. The complex nature of irrigation implementation and farmer time constraints means information presented at a workshop is quickly superseded by day to day activities. Scheduled follow-up encourages the farmer to revisit and complete planned activities and provides the farmer the opportunity to have questions answered as they arise.

System Checks are essential both on commissioning of equipment and regularly over the life of that equipment. Significant productivity losses occur through losses in both water and energy efficiency if equipment is not performing optimally. The cost of these checks is insignificant compared to the potential productivity losses but these checks are rarely valued by farmers. Industry efforts to encourage these checks must be maintained. Resultant repairs can seem expensive but in many cases payback is rapid provided productivity impacts are valued. A potential solution for industry to consider is reporting potential productivity costs when providing system performance reports to better inform farmer decision making.

Irrigation automation cuts labour requirements reducing the time dedicated to irrigation while also improving occupational health and safety. Farmers rarely value their time or consider the time dedicated to irrigation however its importance to the

farm business is significant, given many farmers state that they delay irrigation start-up until after calving so that they can “do it properly”. This delay can substantially impact irrigation performance but unless irrigation productivity is measured and monitored this impact on irrigation performance is not recognised.

Conclusions & Recommendations

Smarter Irrigation for Profit significantly increased dairy industry understanding of ‘best irrigation practice’ and strategies to improve productivity. It achieved this outcome by demonstrating the importance of focusing on the ‘basics’. It also provided an opportunity for farmers and service providers to evaluate existing and emerging technologies being used in other agricultural sectors.

Participating farmers and service providers reported they have increased confidence to make changes to their irrigation system, with many already doing so or planning to do so in the near future. Soil moisture monitoring and irrigation scheduling are the two most common changes being implemented.

Despite the importance of maintaining irrigation equipment being highlighted at events, the project evaluation identified this as an area where future activities should focus more.

Whilst participants reported they intended to make changes to their irrigation systems, many nominated barriers to doing so, with the cost of purchasing new equipment, monitoring and maintenance activities thought to be unaffordable in the short term. Additionally, energy costs associated with running irrigation systems are perceived to be prohibitive.

Current industry farm business benchmarking outside of Smarter Irrigation for Profit, does not separate irrigation performance from whole farm performance. Future irrigation projects should link in with existing industry business benchmarking to enable tools such as DairyBase clearly identify irrigation costs and benefits. This would build industry awareness of the potential costs of not getting irrigation basics ‘right’.

A key gap identified by farmer participants is the lack of local service providers capable of offering monitoring and maintenance services. This is impacting uptake of improved practices. Conversely participating service providers reported farmers are unwilling to invest in professional support for irrigation design, scheduling and system maintenance. Future programs should include professional development for service providers to assist them develop a business case for service support in the areas of scheduling and maintenance checks.

1 Project rationale and objectives

Rationale:

The dairy industry is the second largest user of irrigation water in Australia. Increasing cost and availability of water is a major concern for Australian dairy farmers and there is a pressing need for the industry to find and adopt innovative practices and technologies to utilise water as productively as possible.

Whilst improvements in irrigation system design and new technologies have evolved in recent times, early adopters are often finding it difficult to capture the potential benefits of investments in new technologies. There is also a cohort of farmers that are failing to optimise the productivity and profitability of their current irrigation system. This project targeted both cohorts of the industry.

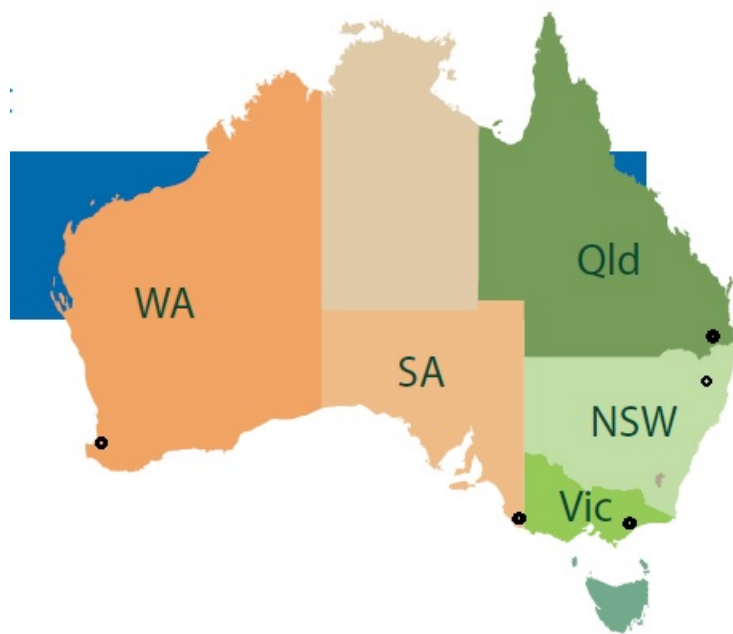
The tools irrigators use to manage irrigation have not changed significantly over the last 20 years. The new wave of precision and automation in surface, centre pivot, and lateral move irrigation systems for broad acre agriculture along with the deployment of cheap sensors, crop models, and irrigation control systems bundled in appropriate built-in technology offer an opportunity for a significant step change in the irrigation performance. Improved capacity to place a greater proportion of the water into the crop root zone without losses, immediately maximises the use of every drop of water and minimises energy consumed to move that water, therefore enabling growers to generate their highest return per ML of water.

The industry agreed performance benchmarks developed through this project will assist the Australian dairy industry identify appropriate water management targets and reporting mechanisms for the Australian Sustainability Framework. Without industry agreed performance benchmarks the industry is vulnerable to the imposition of international standards for water environmental performance that may not be favourable to the Australian dairy industry, for example water footprinting.

The objective of Dairy Smarter Irrigation for Profit was to support the adoption of improved irrigation practices through a network of five farm sites located in major irrigation regions. This network of “optimised irrigation” farms enabled farmers to participate in managing the different systems for different crops and forages and supported cross-sector learnings and knowledge transfer. More specifically the dairy sites enabled farmers and their advisors gain the knowledge, skills and confidence to make major water investment decisions and manage them effectively.

2 Method and project locations

Five optimised dairy irrigation demonstration farms were established in NSW (Loombera & Aberdeen), SA (Mt Schank, Wye and Allendale East), Queensland (Warwick), WA (Benger) and Gippsland (Macalister Demonstration Farm).



Regional technical and farmer reference groups were established and consulted to ascertain local challenges in optimising irrigation.

Each region prepared a local demonstration program that reflected local needs while also encompassing national objectives and priorities.

Over the life of the project a number of regions reviewed their work programs to include additional activities that complimented the initial work program. Some of these activities required additional external funding while “Measure to monitor” “Starting Smarter” and sought additional funds from within the Smarter Irrigation for Profit Program in order to undertake the additional work.

The sale of the Tamworth farm site resulted in the project refocusing in the Upper Hunter of NSW at Aberdeen.

3 Project achievements

Water Application Efficiency

Project sites with pressurised irrigation assessed the water application efficiency of existing equipment. In all cases performance was below industry benchmarks. Localised over and under watering as a result of poor overall performance means that a water balance calculation at the end of the season may not identify this performance issue and correction may not result in reduced water use. However correction will achieve optimised distribution of water across the irrigated area and lead to optimised pasture productivity. As a result of this testing all sites undertook maintenance to improve the distribution uniformity.

	DU (%)	CU (%)	Control panel setting error (mm)*
Industry benchmark	90	90	n/a
NSW			
Pivot 1	65	83	+25%
Pivot 2	79	86	+28%
Lateral	68	79	+33%
Aberdeen	61	73	
SA			
Pivot 1	51	86	-
Pivot 2	39	36	-
Pivot 3	85	90	-
Pivot 4	55	86	-
Pivot 5	73	19	-
Pivot 6	61	39	-
Pivot 7	78	36	-
Pivot 8	73	30	-

"Optimised Dairy Irrigation Farms"

QLD			
Pivot 1	84%		-35%
Gippsland			
Fixed Sprays	74%	82%	-

The catch can test on the 40ha pivot at Mount Gambier showed over-watering on the first 60 metres of the pivot and another section in the middle, totalling 5.64 hectares. Under-watering was evident on the end 70 metres of the pivot (14.5 hectares), so only half the total pivot area was watered somewhere near correctly, which in the 2015/16 irrigation year (including required drainage for salt management) was 7.52ML/ha. Total conservative production losses for this pivot are estimated at \$15,980 per year in feed value.

At the commencement of the project the industry target for irrigation efficiency was 1 t/DM/ML of irrigation water applied. In most cases the project was able to exceed this target. This target could conceivably be increased through adoption of best practice and further research by the industry should support crop specific specific targets.

Location	Year	Irrigation Water (ML/ha)	Production (tDM)	tDM/ML (irrigation water applied)
Aberdeen	2017/2018	4.32	91.36	1.3
Loomberah	2015/2016	3.0	n/a	n/a
Loomberah	2016/2017	2.74	1,135	10.08*
Lateral M (sorghum)				18.4**
Pivot 1				1.6
Pivot 2				2.2
Mt Schank		6.99		2.1
		5.36		2.8
Allendale East	2015/2016	8.25		2.3
	2016/2017	4.84		4.1
Eight Mile Creek (Lucerne)	2015/2016			
	2016/2017	2.94		7.3
Benger (maize)	2017/2018			4.9
(Lab Lab grazed)				1.1
(Lab Lab silage)				1.3
(Millet)				1.0

"Optimised Dairy Irrigation Farms"

(Kikuyu)				0.9
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* Productivity figures at Loomberah were increased by a fodder crop of sorghum on the lateral move site.

** fodder crop of sorghum

Pasture Productivity

In Gippsland the project was able to measure daily growth rates throughout the season and on average pasture production on the soil moisture monitored paddocks greatly exceeded district average pasture production (50 kg/DM/day), particularly over the spring-early summer months. Optimising irrigation efficiency for the fixed sprays saw growth rates peak at 100 kg DM/ha/day, and the spinner cut surface irrigation paddock also produced very well, peaking at 96 kg/DM/day. These productivity levels are comparative to those achieved by Smarter Irrigation in Tasmania highlighting that significant pasture production increases can be experienced if irrigators are encouraged to schedule accurately.

Energy Efficiency was checked in both South Australia and NSW

	Min	Max
Pump Efficiency	12%	75%
Energy Use	99 kWh/ML	522 kWh/ML
	4.1 kWh/ML/m	24.7 kWh/ML/m
Cost	\$21.66/ML	\$120.77/ML
	\$0.83/ML/m	\$5.40/ML/m

In NSW one centre pivot was improved from a pump efficiency of 12% to 75% improving the cost per megalitre pumped from \$120.77 to \$21.66 per megalitre. Over the 7ha pivot at 3 ML/ha this equated to a saving of \$2081. Potential savings through improved pump efficiency improvement in SA were slightly lower at \$ 300 - \$ 1,500 / year.

3.1 Project level achievements

Activities included

- Establishment of the 6 Optimised dairy irrigation sites including local farmer reference groups.
- Establishment and consultation with the project working groups and advisory groups.
- Farmer and service provider Field days, seminars and webinars
- Media releases
- Development of the dedicated project web site
- Dairy Irrigation BMP manual (Irrigation management guidelines)
- Technical publications (conference papers)
- Fact sheets and case studies (hard and web copy)
- Social Media posts & video clips.

Outputs

- Collection, evaluation and presentation of data on energy, water and labour efficiencies for irrigation on 5 dairy farms across Australia.
- 19 field days, 9 workshops and 2 Study tours to discuss the performance of the optimised irrigation farms.
- Updated irrigation management guidelines.
- Dairy Smarter irrigation website and Facebook presence.

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KPI no.	KPI description	Status against KPIs	Outputs
	15 <i>Optimised dairy irrigation</i> field days held and 10 professional development irrigation workshops conducted.	Achieved (16 field days, 9 workshops and 2 study tours)	<p>Field Days</p> <ol style="list-style-type: none"> 1: June 22 2016 NSW 2: August 30 2016 SA 3: September 16 2016 Queensland 4: October 11 2016 WA 5: March 21 2017 WA 6: March 8 2017 SA 7: March 16 2017 Gippsland 8: March 30 2017 SA 9: May 9 2017 NSW 10: October 9 2017 SA 11: October 2017 WA 12: December 4 2017 NSW 13: February 16 2017 SA 14: March 8 2018 Gippsland 15: March 2108 WA 16: April 2 2018 SA 17: April 11 2018 WA 18: April 16 2018 NSW 19: May 3 2018 WA <p>Professional Development Workshop</p> <ol style="list-style-type: none"> 1: August 30 2016 SA 2: November 4 2016 Peter Smith, National 3: March 8 2017 SA

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			<p>4: March 1 2017 IrriSAT Ed Joshua, National 5: April 5 2017 DR James Hills, National 6: August 10 2017 SA 7: September 6 2017 Andy McAlister - Satellite based irrigation automation system – National 8: February 16 2018 SA 9: March 7 2018 SID, Dr Joseph Foley and Marguerite White, National.</p> <p>Study Tours: 1: February 8&9 2017 NSW 2: February 27, 28 and March 1 2018 National</p>
	Dairy <i>Smarter Irrigation for Profit</i> website	Achieved	<p>A readily updateable site has been developed at http://www.dairyingfortomorrow.com.au/tackling-specific-issues/water/smarter-irrigation-for-profit/ New and updated information has been added as provided by each regional project.</p>
	Dairy extension projects participate in cross-sector extension activities	Achieved	<p>The Dairy program has contributed to the Irrigation Automation tours. The NSW Dairy demonstration site hosted a cross-sector study tour. The Dairy project has actively supported the Facebook and Twitter communications. Dairy Australia participated in the annual project meetings at Townsville, Griffith and in Sydney. Dairy conducted the Smarter Irrigation Study Tour in 2018</p>
	Measure to Monitor		
1.1	Select and install monitoring and telemetry equipment in collaboration with participating farmers and service providers. Progress report.	Achieved	SA and Gippsland selected and installed monitoring equipment for their respective projects

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	Actively monitor and review with site team and adjust irrigation practices. Final Report	Achieved	Both SA and Gippsland undertook weekly monitoring and reporting throughout the irrigation season and final reports are attached.
	<i>Integrating Technologies</i>		
	Integrate on farm technologies into the SID.	Achieved	https://sid.usq.edu.au/ Available on Google Play or the App store.
	Establish a farm discussion group to trial the SID providing MERI for further SID development (5 Farms)	Achieved	http://www.dairyingfortomorrow.com.au/wp-content/uploads/Dairy-SID-Project-Promo-V2.pdf Farmer feedback on the setup and use of was provided to NCEA and incorporated into the changes made to the App.
	Report on future implementation of SID	Achieved	Final Report attached
	<i>Starting Smarter</i>		
	Select and install monitoring and telemetry equipment in collaboration with participating farmers and service providers. Progress report	Achieved	SA report attached
	Actively monitor, review with site team and adjust irrigation practices. Final Report.	Achieved	Weekly monitoring and review was undertaken with farmers and the project team, final report is attached.

3.2 Contribution to program objectives

Dairy Smarter Irrigation for Profit has built an irrigation knowledge network across the major Australian dairy regions. It connected local extension providers to key researchers and produced products that are already being utilised in dairy irrigation extension activities in each region.

Providing regional extension teams with access to researcher’s knowledge together with opportunities to attend local irrigation field days and workshops significantly improved the knowledge base in all dairy regions. The project also enabled cross sector linkages, building collaborations at the research, service provider and farmer level as evidenced by cross sector research activities, presentations, field days and bus tours.

Research by Dr James Hills in Tasmania demonstrated that in pressurised irrigation systems average industry irrigated pasture productivity can be doubled by focusing on optimising irrigation. The field sites in this project have confirmed this research finding, identifying significant potential for productivity improvements. If the project findings were to be adopted by all dairy irrigators the potential increase in farm profits would be significant, ranging from \$20,000 - \$60,000 for two centre pivots.

The project also identified important contextual barriers to achieving these improvements beyond technological constraints. These were lack of skilled service providers, poor farmer understanding of the potential benefits and lack of awareness of critical decision points that can impact across the season. Linking irrigation performance to farm business metrics has the potential to significantly improve irrigation productivity.

4 Collaboration

Collaboration was a key feature of this project and was critical to achieving the outcomes.

The Smarter Irrigation Research Leaders were introduced to the regional teams through teleconferences and webinars where they explained their research projects, research activities were integrated into the regional extension programs and Research Leaders provided technical content at field days and workshops.

Each site had a support group made up of innovative irrigators and service providers from each region. The insight provided by these groups was varied and comprehensive, and very strong relationships were developed between the members and between the different groups. Included across the country were industry representatives from West Gippsland Catchment Management Authority, Natural Resources South East, Local Land Services (LLS) Southern Rural Water, and Dairy Companies including Murray Goulburn Trading.

The project built improved relationships between dairy and the irrigation industry, making links with retailers and utilising their support for implementation of project activities. The in-kind support from the irrigation service industry meant more technologies could be demonstrated.

Service providers in the region actively supported the project by attending and contributing to project field days, teleconferences and workshops while also supporting the participating farmers and extending results to their other clients. Hazell’s Farm and Fertiliser and Rick Jordan assisted with agronomy advice. Aqua North Irrigation, Integrated Irrigation and Sapphire Irrigation all contributed. Their involvement was important for local irrigators as their local technicians increased their knowledge and understanding of the importance of sound commissioning, testing and follow-up service via their involvement in the project.

Much of the equipment used came at reduced cost thanks to the support from the industry. Netafim contributed a day to get the sub surface drip up and running at Macalister Demo Farm. Murray Goulburn’s agronomist assisted with installation of the equipment and technical support. In South Australia collaborations with SADA Industry fund provided seed funding to establish each site while Natural Resources South East funded additional catch can testing, energy assessments and an examination of the use of drones to measure plant biomass productivity extending the project to a wider group of farmers across the region.

Collaboration with Davey Water Products resulted in a first for the dairy industry. A purpose designed/ specified pump and remote monitoring system (Monsson IQ) was installed and trialled. This pump reduced energy usage and allowed the farm manager to control the pump workload and switch the irrigators off and on from his smart phone.

North West Local Land Services provided technical advice (EM 38 Mapping, Soil Characterisation/ Health), project planning (representation on the Technical Working Group) and communications (savvy social media use).

“Optimised Dairy Irrigation Farms”

The collaboration with the other dairy Australian Smarter Irrigation for Profit sub-project leaders was rated as extremely valuable by the regional site coordinators, and this collaboration will continue into the future. This cross site and cross sub-project collaboration helped to foster innovation through sharing experiences and learnings both from the sub- projects, and from each member’s wealth of experience. The learnings can be applied broadly across industry and across states.

Consultation and collaboration with local dairy industry groups was integral to the success of extending information generated by the project. DairySA, Western Dairy, Mid Coast Dairy Advancement Group and Hunter Dairy Development Groups provided their farmer and service provider mailing lists for Monthly Irrigation Reports as well as access to their e-newsletters and social media.

Western Dairy, AG Vic, DairySA and Local Lands services NSW are all investing in ongoing activity to continue the work commenced as part of Smarter Irrigation for Profit.

5 Extension and adoption activities

All extension and adoption activities and events are comprehensively described in the attached reports from the regional programs.

Down to Earth Research was commissioned to provide the Dairy Smarter Irrigation for Profit project with greater insights into the impact of the project in building dairy farmer and service provider knowledge and awareness of best practice in irrigation.

Data is based on information given by a total of 51 dairy farmers and 10 service providers who attended at least one Smarter Irrigation for Profit event. Data was collected by in-depth interviews with farmers, and service providers conducted between 1 week and 1 year after respondents had attended events and self-completion surveys answered by dairy farmers directly after attending an event.

In-depth interview respondents were asked whether participation in the project had changed their attitude towards irrigation efficiency in any way, with 65% saying it had. This is typically due to increased awareness of the importance of irrigation scheduling and other options to improve irrigation efficiency. Others reported being focused on irrigation efficiencies prior to attending an event and consequently their attitude was already positive.

Better knowledge of ‘best irrigation practice’ and how to improve efficiencies, as well as equipment and technology options has given almost all the in-depth interview respondents greater confidence to make changes to their irrigation system, with 85% already doing so or planning to do so in the near future. Soil moisture monitoring and irrigation scheduling are the two most common changes being implemented and it is notable they are low cost options.

Additionally, all the dairy farmers answering a self-completion questionnaire on the day of an event confirmed they planned to change some aspect of their irrigation system as a result of knowledge gained.

Although dairy farmers found it difficult to measure the impact of changes made due to the sometimes short timeframe elapsed since they attended an event positive outcomes are expected, particularly relating to cost and labour savings and/or improved pasture growth.

Smarter Irrigation for Profit events were rated highly by both in-depth interview respondents and those answering a self-completion questionnaire, with many valuing the opportunity to view other farming and irrigation systems. Information received relating to irrigation scheduling, new technologies, soil moisture monitoring and approaches for different soil types was highly regarded.

The service providers interviewed also saw value in the Smarter Irrigation for Profit project, typically believing the events highlighted cost and irrigation water savings, benefits of accurate scheduling, particularly start times and new technology as well as creating awareness of new technologies.

“Optimised Dairy Irrigation Farms”

Some aspects for improvement were also highlighted, including the need for greater communication to increase farmer and service provider’s numbers at events, more effective breakdown of barriers to practice change and the need to ensure capacity and capability among service providers to deliver ongoing irrigation monitoring and maintenance.

All advisers mentioned at least one barrier inhibiting farmers making changes to their irrigation systems. As expected, financial restrictions were the most commonly mentioned and it is notable that both purchasing equipment as well as paying for maintenance and monitoring was mentioned. Other barriers included a greater focus on working with animals than irrigation systems, preference to manage irrigation systems in the same way family members had in the past, challenges understanding new technology/computer systems and a limited availability of advisers to provide ongoing maintenance and support.

Suggestions to overcome aforementioned barriers included training for service providers, ensuring data is easy to obtain and suitable for management via iPhone and funding for equipment and/or soil moisture monitoring and maintenance.

Additionally, when asked to comment on the expected impact of on-farm assessments, all viewed the methodology positively in regards to overcoming certain practice change barriers, but a greater focus on cost benefit analyses is essential. Some respondents believed financial assistance may be required to encourage equipment purchases, including soil moisture probes.

Evaluation Conclusions and Recommendations

Participation in a Smarter Irrigation for Profit event has been a positive experience for dairy farmers and service providers, with knowledge and awareness of strategies to improve irrigation productivity increasing, particularly relating to new technologies, irrigation scheduling and the importance of soil moisture monitoring.

Similarly, attending Smarter Irrigation for Profit events has increased participants confidence to make practice changes and has resulted in more farmers focusing on irrigation scheduling and soil moisture monitoring. The outcomes being cost savings, improved water efficiency and increased production per mega litre of water applied.

Despite improvements in confidence and awareness of irrigation efficiencies, considerable barriers still exist to making equipment or infrastructure changes (including soil moisture probes for some respondents) and/or monitoring and maintaining irrigation equipment. While typically the key barrier is cost, a number of respondents cited having equipment and systems different to the optimized irrigation farms as a barrier.

Evaluation results suggest some barriers may be minimised through provision of individualized on-farm irrigation assessments using a similar methodology to the West Gippsland CMA Core 4 program and DA Smarter Energy Use program. Benefits from this approach include working with the existing irrigation setup to identify areas of improved efficiency, for example earlier irrigation start times, cost benefit analyses of implementing changes and an audit of energy usage. Additionally, some respondents believe funding or bulk deals may be required to encourage equipment and infrastructure purchases and/or monitoring and maintenance.

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Other opportunities identified by farmers and service providers included additional training for service providers to ensure adequate regional capacity to deliver irrigation system monitoring and maintenance. While some respondents see benefit in extending similar events in future, more communication activities to increase farmers and service providers attendance is recommended as well as including options to view different irrigation systems and farm sizes.

6 Lessons learnt

The key learning from this project is the extent of the opportunity to improve water productivity on Australian dairy farms. In particular dairy farms using pressurised irrigation systems. Whilst over 50% of Australian dairy farms have some irrigation, dairy farmers do not regard themselves as irrigators in the same way cotton and irrigated cropping farmers do. This difference in culture has slowed the rate of uptake of new technologies and practices to improve water productivity in comparison to other sectors.

The initial perception of the dairy farmers participating in this project was that they were relatively efficient users of water and the hook for participating was the opportunity to assess new technologies. The finding that even the ‘best’ farmers are not getting the ‘basics’ right represents an opportunity to significantly increase farm profit at relatively low cost.

The project identified significant knowledge barriers to realising this opportunity. These barriers were;

- lack of awareness that there are low cost options to improve water productivity,
- poor understanding among farmers and service of the benefits of regular maintenance and system checks,
- the complexity involved in using and interpreting scheduling support tools, and;
- limited access to trusted service providers with the requisite skills and knowledge to provide appropriate advice and services.

Additional barriers were the perceived cost of upgrading irrigation equipment and the challenge of managing multiple paddocks under a rotational grazing system. Unlike cropping, significantly increasing pasture production through more efficient irrigation, can, if not managed carefully impact grazing rotations and pasture quality.

These barriers will need to be addressed if the opportunities are to be realised. One way to address them is to design automated irrigation systems that are cheap, reliable and easy to install that take away the complexity of decision making. Whilst automated irrigation systems are relatively well developed in cotton, the benefits of sensor driven algorithms to inform irrigation decisions is less well quantified for rotational grazing systems. Until they are more traditional extension approaches such as demonstration sites will assist in building knowledge and awareness of the importance of getting the ‘basics’ right.

An additional learning of relevance to the RRD4P program is the benefits to be gained from within sector and cross-sector information exchange. All participants rated this aspect of the project highly and they reported the collaborative networks helped build their knowledge and fostered innovation. Of particular value to farmers were the cross sector and intra-regional bus tours.

7 Appendix - additional project information

7.1 Project material and intellectual property

No Intellectual property has been created.

Reports

Tamworth Final Report

Upper Hunter Final Report

WA Final Report

Gippsland Final Report

SA Final Report

Gippsland Measure to Monitor Final Report

SA Measure to Monitor Final Report

SIFP SID Final Report














7.2 Equipment and assets





















Not applicable

7.3 Media and communications material

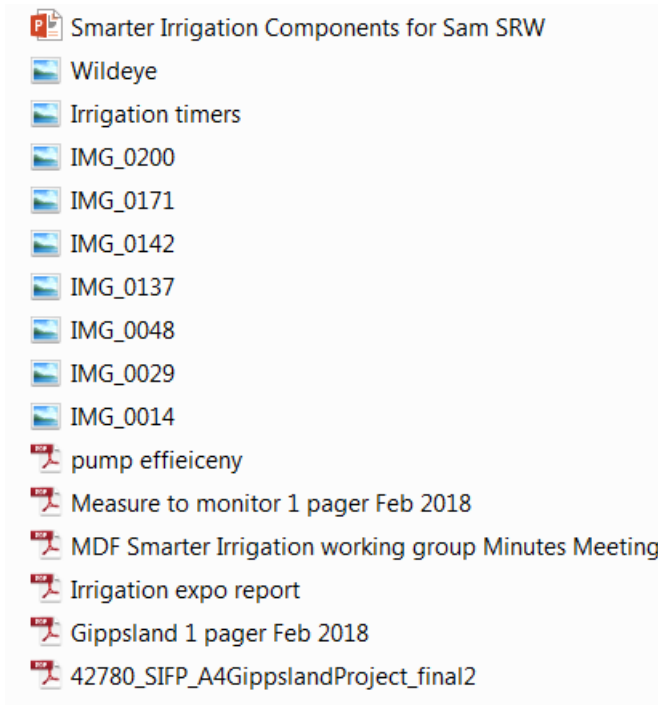
The Smarter Irrigation for Profit website contains many of the communications materials referred to below. <http://www.dairyingfortomorrow.com.au/tackling-specific-issues/water/smarter-irrigation-for-profit/>

“Optimised Dairy Irrigation Farms”

-  Automated Irrigation Field Day
-  Cressy field day irrigation presentation Ma...
-  Dave Barber C4milk
-  DID 2018 Proceedings final
-  Sam Taylor_Rodwell smarter irrigation
-  Peter Hutton
-  Farmer quotes
-  Lablab field day factsheet
-  Commisso Kikuyu 2018
-  Commisso millet 2018
-  Lablab Giumelli_2018
-  Maize Giumelli_2018a
-  Corson's maize decription

-  Smarter-Irrigation-WA-1-pager
-  Smarter-Irrigation-WA-1-pager peter hutton
-  Western Dairy Information Update - Media release April 16
-  IMG_0457
-  IMG_0478
-  IMG_0483
-  IMG_0486
-  IMG_0487
-  IMG_0494
-  IMG_0495
-  Dairy - How Much Water Will I Need 10-2016
-  Beet presentation Oct 2016
-  Harvey Water October 2016
-  Smarter Irrigation WUE Maize
-  Meeting Minutes Irrigation Project Aug 10 2016
-  Milestone Report Smarter Irrigation Sept 30 2016
-  Smarter Irrigation for Profit kicks off in WA - media
-  201603 Irrigation project - QLD media release
-  DairySEQ_map_D1 1 pager
-  DfT-newsletter-32-March-2016-4

“Optimised Dairy Irrigation Farms”



Weekly Gippsland & SA Irrigation and ETo Reports

NSW Monthly reports

- Examples of the project communications are attached and have included:
- SA 1 pager
- “Smarter Irrigation for Profit” April 2016, Dairy SA Newsletter Article
- “System Checks are essential” April 2016, Dairy SA Newsletter Article
- Project media releases have led to “The Stock Journal” producing a full page on the Smarter Irrigation Project printed at the end of July 2016. “Scrutiny on water usage of new tech”, “Farmers hunt for improved efficiency”, “Productivity benefits in focus.”
- Case Study “Do you know what uneven irrigation can cost you?”
- “Do you know what uneven irrigation can cost you?” From the Ground Up newsletter NR SE Spring 16.
- Lucerne Australia, Lucerne Leader 42 Sept 16, “Do you know what uneven irrigation can cost you?”
- “Sprinkler uniformity and timing key to smarter Irrigation Dairy SA Newsletter Article October 2016
- “Four tips for wisely using your water allocation” Dairy SA Newsletter Article October 2016
- “Do you know what uneven irrigation can cost you?” Dairy SA Newsletter Article October 2016
- “Know your soil’s Readily Available Water (RAW)” Dairy SA Newsletter Article October 2016
- “Beware the Green Drought” From the Ground Up,” Summer 16/17
- “Beware the Green Drought,” “Start-up Irrigation, it’s all in the Timing” and “How well do you know your irrigation system.” DSA November 2016
- “Irrigation Tips” Dairy SA, December Newsletter
- “Beware the green drought” From the Ground Up newsletter NR SE Summer 2017.
- “SE Irrigation Energy Efficiency audits reveal opportunity for energy efficiency” From the Ground Up newsletter NR SE Autumn 2017.

“Optimised Dairy Irrigation Farms”

- Be smart with your irrigation field day Ag Connect SE March 17
- “Save \$\$\$ and improve efficiency on your dairy farm” in the DairySA March 17 newsletter (NR SE funded catch can testing)
- “How Smart are you? When it comes to Irrigation” Attachment 10 DairySA eLoop March 17
- “Diary Dates” for the March Energy Assessment field day and workshop and the irrigation Field Day, DairySA Newsletter.
- “Save \$\$\$ and improve efficiency” Lucerne Leader March 2017
- “Selecting right tariff is crucial for minimising costs” DairySA Newsletter April 2017
- “Catch cans and system checks save energy and money”, DairySA Newsletter June 17.
- How much are you losing with the wrong energy tariff? FTGU Winter 2017
- “Do you know what uneven watering is costing you” Ag Connect SE September 2017
- “Starting Smarter” Ag connect SE October 2017
- “Timely irrigation is still essential after wet start to season” Dairy SA Newsletter October 2017
- 2017/18 ‘Best Practice Agriculture in a Changing Climate’ Grants” “Want to drive down your farm energy costs?” FTGU Spring 2017
- “Measurement the key to improving irrigation Performance” FTGU Summer 2018
- 2017/18 Sustainable Agriculture Grants “Drones in Dairy” “Rising energy costs force a rethink on farms” FTGU Autumn 2018
- ‘Measure to Monitor’ report offers insights “ “Smarter Irrigation Tassie tour” February 2018 E-loop
- “Irrigation Innovations Tassie Tour” DairySA Newsletter February 2018
- “Save \$\$\$ on irrigation” April 2018 E-loop
- “How do I select the right Variable Rate Irrigation system?” Dairy SA Newsletter April 2018
- “Case Study “How do I select the right VRI Irrigation system”
- The Land, Livestock (Topic: Tamworth project introduction/ Open Day promotion, Topic: Open Day follow-up story) .
- Country Leader Magazine (Topic: Open Day promotion)
- Northern Daily Leader (Topic: Open Day promotion)
- Murray Goulburn Devondaler, September 2016 (Topic: Limestone Park Project).
- NBN News (Topic: Open Day coverage)
- Lion Dairy News, August 2016- supplier newsletter of Lion Dairy & Drinks
- NSW Mid Coast Dairy Advancement Group, August 2016
- NSW Far South Dairy Industry Group, July 2016
- Case study – the cost of not monitoring soil moisture
- Case study – the cost of not metering power accurately
- Case study – the cost of not monitoring and scheduling
- Case study – the cost benefit of optimising yield potential
- SID case study – Scott Wheatley
- SID case study – Shane Gee
- SID Case study Tom Middlebrook
- SID case study Adam Forbes

A webinar presented by the SARDI (SA) on their progress modelling water application rates for the SA centre pivots on the 3rd of March 2016

2018 – IAL Conference Paper - Achieving improved profitability on irrigated dairy farms.

During the Tamworth project all farmers had access to:

Limestone Park’s soil moisture probe loggers in real-time via personal access to the Tain App or Panorama website.

Limestone Park’s SID so that they can view the irrigation decisions being made.

AgQuip 2016, Gunnedah poster prepared for the field days

Tales from cotton study tour, invite, program, presentations & photos

Tasmanian study tour, invite, program, presentations & photos

7.4 Evaluation report

Optimised Dairy Farms Evaluation Report (Watson, D. 2018)

7.5 Budget

A statement of funds and contributions received and spent over the life of the project.

If practical, this section may be the final financial report (section E.4 of the grant agreement), containing:

- financial statements for the receipt, holding, expenditure and commitment of the grant, including a full reconciliation against the budget in the grant agreement and statements clearly showing expenditure against the grant
- a report of the receipt of other contributions (including the grantee’s contributions), or if other contributions were not received as projected, an explanation of action taken in response to this shortfall
- the interest that the grantee has earned on the grant.

If not practical to satisfy requirements for the final financial report at the time of submitting the final report, please use this section to give a statement of the budget for the life of the project and submit the final financial report within 60 days of submitting the final milestone report.