

## Expression of Interest EOI 2018-19

### Part 1- General Details

		EOI ID	
<b>EOI Title:</b> (max 80 char)	Project Evaluation. Smarter Irrigation for profit.		
<b>Type of Research</b>	Applied		
<b>Proposed Start Date:</b>	1/12/2017	<b>Proposed Cease Date:</b>	30/4/2018
<b>Please refer to CRDC's Strategic R&amp;D Plan 2013-2018 for the following.</b>			
<b>CRDC Program</b>	1. Farmers		
<b>CRDC Theme</b>	1.2 Productive Resource Efficiencies		
<b>CRDC Strategy</b>	1.2.3 Developing new systems and tools to support farm decisionmaking processes.		
<b>Please identify the relevant Measure of Success as outlined in the CRDC Strategic R&amp;D Plan.</b>			
<b>CRDC Measure of Success:</b>	Farmers are able to improve their productivity per hectare of land		
<b>Science and Research Priorities</b>	Food(3i) enhanced food production through: novel technologies, such as sensors, robotics, real-time data systems and traceability, all integrated into the full production chain.	50 %	Soil and Water(3) minimising damage to, and developing solutions for restoration and remediation of, soil, fresh and potable water, urban catchments and marine systems.
<b>Rural R&amp;D Priorities</b>	Soil, water and managing natural resources, to manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts;		
<b>R&amp;D Manager:</b>	Jane Trindall, CRDC	<b>EOI Due Date:</b>	9/11/2017
<b>Submission</b>	FRP should submitted to grants@crdc.com.au	<b>EOI Closing Date:</b>	11/12/2017

**For more information contact;** Dr Guy Roth, Smarter Irrigation for Profit, project leader for CRDC, 02 67992202, 0417 223179.

### Part 2 –Expression of Interest Requirements

#### **Background**

The Smarter Irrigation for profit project aims to improve the profit of cotton, dairy, rice and sugar irrigators with the support of 16 research and development partners and 19 farmer irrigation technology learning sites. Grower led irrigation research and extension aims to collect commercially relevant comparative data on different irrigation systems and technologies. The intention is to provide growers improved understanding of the implications for capital investment, management and the resource requirements (water, energy and labour) associated with different irrigation systems. Incorporated into this is the adoption of automation technology and different approaches to farming systems with a specific focus on irrigation scheduling.

The project consists of three components.

1. Practical, reliable irrigation scheduling technologies
2. Precise, low cost automated control systems for a range of irrigation systems
3. A network of 19 farmer managed learning sites located around Australia.

The expected outcomes are:

1. 10-20 percent improvement in water productivity, efficiency and farmer profitability
2. Adoption of new irrigation technologies and science application by farmers and irrigation professionals to improve farm profits.
3. Improved cross sector industry research collaboration with public and private sectors in four major irrigation industries providing a legacy platform for other sectors to also benefit.

This project included the following components:

2 *Irrigation scheduling technologies (plant, soil, weather)*

- a) Quantifying the performance of automated satellite/weather-based irrigation scheduling systems with respect to pasture production, irrigation performance, labour costs and management requirements for dairy.
- b) Comparing irrigation strategies for different cotton crops stages, soil types, regions and climatic conditions to identify potential for improvements in productivity and water-use efficiency for cotton.
- c) Integrating tools used for irrigation across different crops, regions and scales to provide the best information for irrigation decision scheduling decision making.
- d) Evaluation of scheduling tools used in the sugar industry.

3 *Smart automated irrigation*

- a) Development of a precise and automated control prototype for cotton, sugar and dairy pressurised and furrow irrigation systems in the Burdekin (QLD), Narrabri (NSW), Dalby (QLD) and Tasmania.
- b) A detailed assessment of the irrigation delivery system, energy and water use efficiency, changes in irrigation scheduling, system design, irrigation uniformity on participatory farms and an economic analysis and productivity assessment on performance against benchmarks.
- c) Improved irrigation bay design for dairy pastures. This will involve a demonstration field site operating, monitoring and benchmarking to identify most profitable bay design modifications. Key parameters of more efficient and profitable systems will be proposed.

4 *Optimised irrigation farms (energy, water nexus)*

- a) An investigation of irrigation layouts to maximise water and nitrogen input efficiencies and reduce capital and operational costs (energy) on three - four grower led focus farm sites in Southern NSW and Victoria.
- b) Grower led systems comparison in the Gwydir Valley, NSW. This will involve an evaluation of the performance of irrigation systems on two grower led focus farms, including water use efficiency, energy use, labour requirements and crop production for four seasons.
- c) Three key demonstration sites will be established on commercial dairy farms in WA, SA, Victoria and Tasmania. The sites will quantify the expected water, energy and labour savings associated with adoption of innovative irrigation technologies over two irrigation seasons, as well as the associated management/skills requirements, maintenance costs and labour and lifestyle implications.

More information on the project can be found at Smarter Irrigation for Profit – Project Overview information booklet that is publically available on the [cottoninfo.com.au](http://www.cottoninfo.com.au) website

<http://www.cottoninfo.com.au/sites/default/files/documents/Smarter%20Irrigation%20project%20info%20booklet%20SUMMARY%20ALL%20SUB%20PROJECTS.pdf>

**Outcomes:**

This project will deliver a Report (s) on the impact of the project outputs and outcomes. This will include a final integrated report, plus an interim stand alone sub report during the project.

**Project description:**

The purpose of this project is to undertake monitoring and evaluation and knowledge harvest to capture the outputs and outcomes of the research and adoption activities that make up the Smarter Irrigation for profit project.

Evaluation requires systematic collection of information about what CRDC and other partners have invested in, what has been done and produced, the new knowledge generated, products or technologies made available, industry understanding and awareness of the research and changes in the management practices used along the supply chain. Broadly, the M&E framework will adopt the principles of the Program Logic model used by most Rural Research and Development Corporations. This will enable detailed reporting of resources, activities, participation, reactions to this participation, changes in knowledge/attitudes/skills/aspirations of farmers and other end users, practice change as intermediate outcomes and outcomes. Evaluations can use both quantitative and qualitative data. Quantitative data is essential for economic return/ profitability data and benefit cost analysis. Qualitative data gives greater depth of understanding. It is useful in linking economic factors to the research. For example, attitudinal change is an important step in achieving water use system changes and efficiencies.

To date, the project monitoring and evaluation (M&E) has relied on reporting by the sub project teams through six monthly milestone reports. Whilst some these reports contain evidence of the project impacts there is scope to improve the clarity and quality of the impact reporting of specific sub projects as well as pull these together into a coherent story at a project/program level.

It is envisaged the project will need to work with the nine sub project leaders to capture information. Most of the sub projects have been underway for 2.5 years and have less than six months to completion (Final date 30/5/18) and therefore the projects are maturing which provides an opportunity to collate and assess impacts.

In addition to the specific sub projects, there has been a goal to improve the cross sector sharing of knowledge across the cotton, rice, dairy and sugar industries and this also needs to be collated and assessed.

The project team may wish to use various M&E methods such as an informed persons survey and interviews. It is envisaged case studies with end users (farmers/advisers) will be captured on what practices they have changed or are planning to change. Some more detailed case studies would be expected around profitability and economic analysis.

The final report could include staged outputs (reports) delivered on certain milestones dates during the project. The final report will also need to contain a program logic framework consistent with the Government's (MERI) framework. The report could also capture gaps and opportunities that have emerged and next steps to build future work upon.

**Project Investment:**

Budget indicated is maximum available (ex GST)

Year	2018-19	2019-20	2020-21	
Indicative budget (up to)	\$60,000.00	0	0	

**Part 3 – Selection Criteria**

The following selection criteria will be used by the CRDC to assess the proposals received for each Expression of Interest.

**1. A sound understanding of the nature and importance of the irrigation outcomes to the Australian cotton, sugar, rice and dairy industries: (20%)**

**2. Soundness and clarity of the proposed methods to address project deliverable outcomes: (40%)**

The research applicant must describe how the research methodology employed will enable the project outcomes to be delivered. Different options may be presented. Staged milestones/outputs should be clear.

**3. Demonstrated capacity of the nominated team to provide project implementation for the timely delivery of high quality outputs: (20%)**

The applicant must describe the research team's project skills and experience and may include a recent example of a completed project (s).

**4. The cost effectiveness of this project (20%)**

The research applicant should demonstrate market value and market fairness for the proposed budget. The budget should be detailed enough to understand components of work and milestones. Three to four Milestones would be sufficient. The budget should be (Ex GST).

**For more information contact;** Dr Guy Roth, Smarter Irrigation for Profit, project leader for CRDC, 02 67992202, 0417 223179.

## Project Summary

<b>Project title</b>	Smarter Irrigation for Profit
<b>Grantee</b>	Cotton Research and Development Corporation
<b>Partner Organisations</b>	Dairy Australia, Rural Industries Research and Development Corporation, Sugar Research Australia, Victorian Department Economic Development, Jobs, Transport and Resources, Tasmanian Institute of Agriculture, CSIRO, NSW DPI, University of Southern Queensland, Gwydir Valley Irrigators Association, SARDI, Southern Growers Inc, Irrigation Research and Extension Committee, Irrigated Cropping Council, NSW Local Land Services, Sundown Pastoral Company, Auscott Ltd.
<b>Communications/ Contact</b>	Dr Guy Roth, Project Leader, 02 6799 2202, 0417 223 179, guy.roth@sydney.edu.au
<b>Project narrative</b>	The project aims to improve the profit of 3,000 cotton, dairy, rice and sugar irrigators with the support of 16 research and development partners and 19 farmer irrigation technology learning sites. Grower led irrigation research and extension aims to collect commercially relevant comparative data on different irrigation systems and technologies. The intention is to provide growers improved understanding of the implications for capital investment, management and the resource requirements (water, energy and labour) associated with different irrigation systems. Incorporated into this is the adoption of automation technology and different approaches to farming systems.
<b>Objectives</b>	The project consists of three components. <ol style="list-style-type: none"> <li>1. Practical, reliable irrigation scheduling technologies</li> <li>2. Precise, low cost automated control systems for a range of irrigation systems</li> <li>3. A network of 19 farmer managed learning sites located around Australia.</li> </ol>
<b>Locations</b>	Qld; Ayr, Emerald, Warwick, Dalby, Toowoomba, St George. NSW; Moree, Narrabri, Wee Waa, Hunter, Whitton, Jerilderie. Vic; Numurkah, Shepparton, Macalister. Goulburn Murray Irrigation District, Tasmania; Rocky Creek, Sisters Creek, South Riana, Montana, Cressy. SA; Allendale, Eight Mile Creek, Mt Schank. WA;Harvey.
<b>Key activities</b>	<p>A number of activities have targeted sharing knowledge and collaborations across different sectors of rice, cotton, sugar and dairy. These included bus tours to other industries, social media, workshops and farm field days.</p> <p>The project involves about 30 people from 19 organisations.</p> <p>The project is partnering with irrigation automation service providers to demonstrate affordable automated irrigation scheduling systems in different regions and industries.</p> <p>Two satellite based scheduling irrigation performance pilots are being implemented on commercial dairy farms in Northern Victoria. The system combines recent and forecast weather data with satellite imagery to provide local, web based crop and location specific measures of reference evapotranspiration and crop coefficients for use in irrigation scheduling. The project has used the 2D ANUGA Hydro surface water flow model to evaluate different irrigation bay surface designs. We have identified the most promising bay designs with respect to simulated hydraulic performance and have documented this work in a technical report.</p> <p>A series of detailed field experiments investigating various aspects of cotton irrigation management are underway looking at irrigation at planting, timing of first irrigation and limited water experiments. These experiments include the</p>

	<p>use of novel plant based sensing technology (canopy temperatures and crop models).</p> <p>An integration workshop was held which partnered with the national Water Use in agriculture RD&amp;E strategy. Over the period of 3 days a number of cross sector integration and collaboration opportunities were identified.</p> <p>The project has hosted a number of specific cross sector knowledge sharing events including workshops, field days, and social media and bus tours. Feedback has been positive in relation to learnings of farmers from other industries.</p> <p>Field work activity has been completed at three sites to remotely control the irrigations in furrow irrigation of cotton and sugarcane. Remote control of variable rate irrigation was also applied on a lateral move irrigation system on the Darling Downs. Research and select enabling elements for commercial broad-acre autonomous irrigation systems for both furrow and centre pivot irrigation, including soil, plant, and atmospheric field sensors as well as irrigation system sensors, separate simple and complex data transmission systems, reliable remote low power solar supplies for these systems, and report on a broad integrating design that incorporates existing VARIwise and irrigation system simulation software for optimal performance.</p> <p>Five pivot irrigated pasture sites on dairy farms in north and northwest Tasmania have been set up to collect data on power and water use and soil moisture and weather parameters. Each site was also mapped to determine the variability in soil types and elevation. During the 2016/17 irrigation season, a weekly update of rainfall and evapotranspiration for each site was provide to the participating farmers along with access to soil moisture and temperature to assist with irrigation scheduling. A major activity was also undertaken at one site to test the use of various technologies for measurement of soil moisture both spatially and temporally. On the key focus farm, cameras were set up to assess the ability to measure pasture growth rates autonomously to assist with the development of an autonomous irrigation control platform.</p> <p>In southern NSW four Key Learning Sites (KLS) with activities aligned to the interest of grower group hosting the sites. Two sites have a cotton basis and are hosted by the Irrigation Research and Extension Committee (IREC) while the other site has a maize basis and is hosted by the Irrigated Cropping Council (ICC), are focused on the interaction between irrigation management and nitrogen use efficiency (NUE). The third site, established with Southern Growers (SG), is investigating the potential for double cropping with two grain crops within the one calendar year, through the utilization of new short-season rice and wheat varieties.</p> <p>In the Gwydir valley (Moree, NSW) the four irrigation systems (drip, lateral move, bankless and traditional surface irrigation) are being compared for their water use efficiency, productivity, labour and energy inputs. Row configuration trials were also completed. A very successful field day was held in February 2017 and was attended by about 110 people from many cotton growing regions. The trial results were published and given to participants. The field day also included growers from the sugar and rice industries, which was a specific activity to encourage cross sector engagement.</p> <p>The Optimised Dairy Irrigation demonstration farms (have commenced in 5 locations and progress at all sites has been good. Baseline data collection has highlighted inefficiencies in even newly installed systems. EM38 survey, distribution uniformity testing, energy efficiency audits, soil moisture monitoring and improved irrigation scheduling are key themes at each site.</p>
<b>Outcomes</b>	<p>The expected outcomes are:</p> <ul style="list-style-type: none"> <li>▪ 10-20 percent improvement in water productivity, efficiency and farmer profitability</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Adoption of new irrigation technologies and science application by farmers and irrigation professionals to improve farm profits.</li> <li>▪ Improved cross sector industry research collaboration with public and private sectors in four major irrigation industries providing a legacy platform for other sectors to also benefit.</li> </ul>
<b>Implications</b>	<p>The dairy, cotton, sugar and rice industries will have access to crop and climate based irrigation demand technology to improve the uptake and application of irrigation water to crops and pastures. By improving water application methods and fine tuning irrigation scheduling, costs can be reduced, water saved, yield/crop quality improved and profits increased. These new technologies will aid irrigators during the extremes of water scarcity as well as avoid deep drainage and waterlogging. There are a number of alternative irrigation systems; drip, centre pivots and lateral move irrigators, bankless channel and traditional surface irrigation methods. Growers want better data on water use, labour inputs, energy costs and other agronomic parameters for each of these approaches to evaluate which system will be most profitable for them in the long term. One of the major problems farmers face is the rising cost of labour. Irrigation automation will reduce labour costs and improve water application timing.</p>
<b>Publications/ Communication Material</b>	<p>Smarter Irrigation for Profit – Project Overview” information booklet that is publically available on the conttoninfo.com.au website  <a href="http://www.cottoninfo.com.au/sites/default/files/documents/Smarter%20Irrigation%20project%20info%20booklet%20SUMMARY%20ALL%20SUB%20PROJECTS.pdf">http://www.cottoninfo.com.au/sites/default/files/documents/Smarter%20Irrigation%20project%20info%20booklet%20SUMMARY%20ALL%20SUB%20PROJECTS.pdf</a></p> <p>Smarter Irrigation Overview video  <a href="https://www.youtube.com/watch?v=JNrTOcdhxok">https://www.youtube.com/watch?v=JNrTOcdhxok</a></p> <p>The Smarter Irrigation Web page for the dairy industry  <a href="http://www.dairyingfortomorrow.com.au/tackling-specific-issues/water/smarter-irrigation-for-profit">http://www.dairyingfortomorrow.com.au/tackling-specific-issues/water/smarter-irrigation-for-profit</a></p> <p>Smarter Irrigation Social media page (Facebook)  <a href="https://www.facebook.com/SmarterIrrigation/">https://www.facebook.com/SmarterIrrigation/</a></p> <p>Some project videos are being made. One example,  <a href="http://www.utas.edu.au/tia/centres/irrigation/projects-new/projects-new/smarter-irrigation-for-profit">http://www.utas.edu.au/tia/centres/irrigation/projects-new/projects-new/smarter-irrigation-for-profit</a> which includes a video describing the project.</p> <p>An example of a System comparison brochure and poster showing the result from four years at Keytah. Brochure available at  <a href="http://www.gvia.org.au/IrrigationEfficiencyProgramme2.htm">http://www.gvia.org.au/IrrigationEfficiencyProgramme2.htm</a></p>