SRDC Research Project
Final Report

Cover Page:

Title of the Project: A review of institutional arrangements in the Burdekin Irrigation Area with a view to managing sustainable farming practices in the region.

Project Reference Number: CG018

Name(s) of the Research Organisation(s): CANEGROWERS

Principal Investigator's name(s), contact phone number, address and Email address:
Eric Danzi
(07) 3864 6444 / 0418 184 901
GPO Box 1032 Brisbane QLD 4001
eric_danzi@canegrowers.com.au

The project participant/s wish to acknowledge receipt of project funding from the Australian Government and the Australian Sugarcane Industry as provided by the Sugar Research and Development Corporation.

Body of the Report:

Executive Summary:
In the late 1980's the Burdekin dam commenced operation and resulted in a large area of land being cleared and converted to irrigation. This influx of water has caused the groundwater level to rise alarmingly over the past 20 years from its previous level typically 10 to 15 meters below the surface to around 0.5m in some places in 2009. This is an alarming increase and if not rectified and reversed quickly will lead to significant crop losses and is likely to render some land unviable for farming in the next 5 years.

The original objective of the project was to review of institutional arrangements in the Burdekin Irrigation Area with a view to managing sustainable farming practices in the region. These objectives have been achieved in the project and the project has gone far beyond the original objective of the project. We are now almost 6 months into implementation which was considered beyond the realistic scope of the original project.

A consultant undertook an analysis of the current state of the BRIA groundwater system and made recommendations on what needs to be done in the BRIA to correct the groundwater problem. The consultant also made broad estimates of a range of possible leakages that may be occurring from irrigation and leaking channels since there was inadequate data to be more accurate.

If the trend in groundwater levels continues to rise over the 10 years it is reasonable to expect that large areas of the BRIA will taken permanently out of cane production. Although it is hard to estimate how much area could be affected it would be likely that at least 10 per cent of the BRIA would be at risk which is around 4000ha. At 115t/ha average production this amounts to almost 0.5mt of cane could be lost out of the industry if the groundwater problem is not fixed. At current sugar prices, this would be a loss of aver $30m in sugar production alone.

The next phase of the project has already commenced and is about implementation of the plan developed in this project. There is a significant need for further funds for this to be successful. CANEGROWERS in currently investing in employing a consultant to develop an automated flood irrigation system for the BRIA as outlined previously in this report. This is due for completion in June 2010 and if it is successful we will be able to roll this out commercially to growers in the BRIA and encourage uptake.

Background:
In the late 1980's the Burdekin dam commenced operation and resulted in a large area of land being cleared and converted to irrigation. Also for some land which had previously been irrigated from groundwater, they now receive their water from the Burdekin dam.

This influx of water has caused the groundwater level to rise alarmingly over the past 20 years from its previous level typically 10 to 15 meters below the surface to around 0.5m in some places in 2009. This is an alarming increase and if not rectified and reversed quickly will lead to significant crop losses and is likely to render some land unviable for farming in the next 5 years.

This project was designed to start the reversal of this very serious groundwater problem.

Objectives:
The original objective of the project was to review of institutional arrangements in the Burdekin Irrigation Area with a view to managing sustainable farming practices in the region. These objectives have been achieved in the project and the project has gone far beyond the original

objective of the project. We are now almost 6 months into implementation which was considered beyond the realistic scope of the original project.

Methodology:
This was not a research project but rather the funding was largely used to fund a consultant to undertake an analysis of the current state of the BRIA groundwater system. Also, given the consultants extensive knowledge of irrigation schemes in other parts of Australia and groundwater hydrology, to make recommendations on what needs to be done in the BRIA to correct the groundwater problem.

There was inadequate groundwater information for the BRIA for the consultant to undertake extensive modelling of the effects of irrigation, leaking Sunwater channels and rainfall on the levels and salinity of groundwater in the BRIA. As a result the consultant was only to make broad estimates of a range of possible leakages that may be occurring from irrigation and leaking channels.

Although it would have been preferable to get more accurate data on leakages, this was not imperative to the project since it is clear to almost all stakeholders that the losses from both irrigation and Sunwater systems (from channels, balancing storages and drains) are both very significant. And for the groundwater problem to be reversed, a large reduction in losses is required from both Sunwater and irrigation.

Outputs:
There have been a range of outputs to date from the project with many more expected to be completed after the project has ended. There have been a preliminary report by the consultant and a final report which have both been previously submitted to SRDC and have been personally presented by the consultant to SRDC. In addition, the BRIA groundwater plan below is another output and this includes a clear articulation and agreement on the priority areas that need to be addressed to reverse the groundwater problem.

Intellectual Property and Confidentiality:
None

Environmental and Social Impacts:
To date the have been no environmental outcomes of the project but this was never intended to be the case in the initial phase of the project funded by SRDC. However if we are successful in implementation of the project plan over the next few years the environmental and social outcomes will be significant. We are aiming to reduce water losses to the groundwater and increase groundwater pumping to try and reverse the rise in groundwater levels in the last 20 years. If this is successful and the groundwater levels falls we will avert a major environmental disaster and social problem by stopping large areas of land being salt affected and permanently taken out of agricultural production.

Expected Outcomes:
If the trend in groundwater levels continues to rise over the 10 years it is reasonable to expect that large areas of the BRIA will taken permanently out of cane production. Although it is hard to estimate how much area could be affected it would be likely that at least 10 per cent of the BRIA would be at risk which is around 4000ha. At 115t/ha average production this amounts to almost 0.5mt of cane could be lost out of the industry if the groundwater problem is not fixed. At current sugar prices, this would be a loss of aver $30m in sugar production alone.

Milestone 6 requirements:

1. Submission of final report. Final report accepted by SRDC
   This report is the final report of the project.

2. Final Lower Burdekin LWMP including actions for improved institutional arrangements
   The final BRIA groundwater plan below was finalised and signed off in March 2009. It includes very clear timelines and actions including for changed institutional arrangements and policies. In the 5 months since March 2009, a great deal of action has occurred and this is reflected in the table as the dot points in the how column.

BRIA groundwater 5 year plan – Progress as at 30th August 2009

Aim is to reduce groundwater and salt levels in BRIA below December 2008 levels in 2014. This will involve decreasing levels in some sections, maintaining others and slowing the increase in others.

What	How	Who	When	Target
1. Increase on farm irrigation efficiency to reduce deep drainage	Presentation on continuous sharing to BRIA groundwater committee • It was decided this was not necessary and a presentation to the BRIA in October 2009 when the ROP is finalised is more appropriate.	TV	Mar09	Presentation done
	Undertake modelling to determine under what conditions CS would not have negative environment impact including carry over and forward rules	TV	May09	Modelling complete
	Presentation to BRIA Irrigators committee	TV	Jun09	Presentation done
	Determine losses from irrigation in all sections of BRIA and in total. Hold workshop to determine. Set targets on how many losses to groundwater in all sections of BRIA and in total and monitor yearly. Identify key practices on farm to reduce deep drainage. Flow rates, recycle pits, scheduling tools, controlled traffic/minimum tillage, set times, row length, managing sets, turning off water 60m from end of row?: • It was very difficult to accurately estimate drainage losses from irrigation. Instead, we will use application efficiency being t cane per ML (irrigation and effective rainfall) to determine whether improvements in irrigation efficiency occurred which would have a beneficial impact on groundwater levels • The benchmark will be the average of 2007/8 t/ml for the entire BRIA which was around 9.3. • Target is a 5% increase in efficiency by 2014. • Sunwater losses 85,000ML for 2007/8 • Losses to drainage from irrigation and rainfall appear to be around 2ml/ha under best practice irrigation and would be around 3-4ml/ha now. If this is correct, allocation from groundwater should be revised to 2 from 1 now • Re irrigation practices, we decided that the key question was how long do growers have their sets go for before cutting them off? • It was suggested that anything longer than 12 hours is too long. We need to validate this. Also, need to survey growers to see how many are complying	ED	Jun09	Losses identified Targets set Practices identified

	• Wayne to set up a spreadsheet with all growers in BRIA listed in rows and do columns for 2009, 2010, 2011, 2012, 2013 and 2014. Just record if 12 hours or less or not. May need to review this. • If under 12 hours, keep doing the same • If over 12 hours, need to review flow rate, tillage and scheduling to see which needs to be changed to get under 12 hours			
	Determine current uptake of key practices and likely current losses to deep drainage from each practice	WS	Nov09	1 report
	Put together plan to encourage large scale adoption of key irrigation practices to reduce drainage. Will include extension using SIRMOD to show losses under each farm. Link in with reef rescue program, Water boards modernisation plans and other funding sources to increase adoption • See attached draft extension and communication plan. • We identified in May 2009 that there was a real impediment to the adoption of 12 hour irrigation sets being the extra labour required to undertake this compared to the typical 24 hour set. Consequently, we have put together a project to the value of around $20,000 to be funded by Canegrowers that aims to develop an automated flood irrigation system for the BRIA. • The details of this project are currently being worked out with an irrigation consultant with expertise in automating irrigation for the horticultural industry using drip and micro jet irrigation. It is expected that this project will start by the end of September 2009 and be completed by June 2010. Details of this project are tabled below in the Automation of furrow irrigation project.	WS,ED	Oct09	1 plan
	Implement extension program to change practices	WS	Dec09	Program in place
	Get approval from NRW re implementing CS in Burdekin	TV	Dec09	Approval given
	BRIA growers, NRW and Sunwater make a decision on whether CS will be implemented	TV	Jun10	Decision made
	Implement continuous sharing (CS) in BRIA if desired	TV	Jul11	CS operating
2. Increase ground water pumping and reuse	Identify areas where groundwater levels are of most concern and where water quality and permeability would allow groundwater pumping and reuse. Also current water and salt levels, adoption of pumps and realistic future pumping. • This monitoring has been undertaken for many years and there is no change from previously targeted areas around Mona Park	GJ	May09	Map showing target areas & current levels
	Identify and secure external funding sources for groundwater pumps potentially from reef funding, DEW, NRW, CRC, DAFF, Office of Northern Australia: 1. Reef Funding will not pay for it – Reef Rescue is almost entirely focussed on implementing the ABCD practice change framework. Unless there's some way of demonstrating that GW pumping and reuse will reduce nutrient and pesticide	SC	Jun09	Funding secured

	loads to the GBR, there's not much hope of funding. 2. DEWHA – no (their funding is largely Caring for our Country, and this does not align to the Business Plan targets). 3. NRW (DERM) – the State is an obvious (given that their development of the BRIA was core to the problem) contender. I will discuss further with Randall C, but in these financial times, don't believe this is likely. 4. CRC – don't know – but believe they're not focussed on operational matters (I will discuss further with Keith) 5. DAFF – no. 6. Office of Northern Australia – no (the Burdekin is not considered to be northern Australia) • Will follow up further and advise you when I have more info.			
	Look at feasibility of planting trees and other deep rooted crops to use groundwater and significantly reduce groundwater level: • Discussions with researchers and farmers in the past few months indicate that it is pointless to pursue this as a serious option to address groundwater problem. It would take a lot of trees to have any impact on groundwater levels and it is extremely unrealistic to expect this to occur.	GE	Jul09	Study completed
	Develop plan to promote increase groundwater pumping and reuse in key areas identified above	WS	Sep09	Plan developed
	Look at feasibility of charging levy on surface water use in BRIA to fund groundwater exploration, capital costs and subsidy on groundwater use	WS	Dec09	Decision made on feasibility Plan
	Implement plan and review yearly	WS	Jan10	Implemented & reviewed yearly
3. Reduce channel and weir losses	Complete Sunwater modernisation planning study to determine the magnitude of losses throughout the scheme • The draft report by GHD was completed in June 2009 and the final is expected to be released soon.	GE	Dec09	Study completed
	Secure funding structure to achieve desired reduction in losses either as commercial arrangement by Sunwater and/or water users or external funding from bodies including NRW, DEW, NWC, reef funding... • A number of discussions have occurred on this front to date. Given the commonwealth government 100% focus on the Murray Darling for water issues, there is next to no chance that the DEW will assist in funding. NWC has little funding available and the reef rescue program is not focused on irrigation losses. • Water users will not pay for channel lining since they have enough to spend on their own farms to reduce water losses to groundwater. In addition, Sunwater owns any water saved and is unlikely to consider handing this to growers if they invested in channel loss reduction projects. • Discussions have occurred between Canegrowers, DERM staff and minister's advisors and Sunwater. We believe there is some chance of getting the 2 shareholders ministers of	GE	Feb10	Funding structure approved

	Sunwater (the treasurer and minister for natural resources and energy) to reinvest any Sunwater dividend for 1 or 2 years in this area. This could allow matching funding by Sunwater and encourage significant investment.			
	Implement plan and yearly review	GE	Apr10	Plan implemented & reviewed yearly
	Undertake hotspot assessment to determine which sections of channel have biggest losses and which sections should be lined first • Unfortunately the commonwealth government has cancelled the intended electronic mapping of losses in all channels and balancing storages in the BRIA since they are only doing this in the Murray Darling Basin. • Sunwater has planned to undertake a manual assessment of losses for sections of some channels as part of their periodic channel shutdowns for maintenance in 2009/10. This process takes a week for each section and involves the ends being blocked off and the channels filled with water. The seepage loss is estimated to be the change in water level over the week minus evaporation.	GE	Jun10	Assessment completed
	Following on from hotspot assessment and modernisation plan, put together implementation plan on how much to reduce losses, where and how losses should be reduced.	GE	Dec10	Implementation plan developed
4. Export salt water out of BRIA ground water	Engage EPA, DEWH, and other relevant bodies that exporting of salty water is not intended because of bad irrigation and distribution system practices. This has to occur even with the most efficient distribution and irrigation practices. Obtain feedback from EPA and others re conditions under which salt water movement would be considered and when it would not • Numerous discussions within DERM have occurred in Brisbane and Townsville but there is a long way to go before any approvals to discharge salt from the BRIA into rivers are given • Given the merging of EPA and NRW to make DERM it is still unclear whether this will assist in getting approval to export salty water out of the BRIA. However, it is hoped that this will be the case.	GJ,RC	Apr09	Consultation commenced & clear feedback received
	Determine whether salts should be reused in BRIA system including drainage, placed in evaporative ponds or exported to river • All options have been considered and are being left on the table until the plan is done in 2010. However, exporting salty water is likely to be the most realistic option. • Reusing salty water in the BRIA will lead to increased permeability of channel soils leading to increased losses to groundwater. Also, redistributing salts throughout the BRIA groundwater system is not a desirable outcome. • Using evaporative ponds is a very expensive option both in capital and running costs. Also, it will have a very negative effect on the land where they are located and the salt will probably need to be disposed of from these sites.	GE,GJ	Jun09	Feasible options identified

	Develop a clear plan about how to export salts including drainage system and detailed structure to be used. Consider other water issues outside salt including nutrients and chemicals	GE,GJ	Jun10	Plan developed
	Demonstrate to EPA and other relevant bodies that irrigation and distribution and irrigation efficiencies have increased or a plan in place which will work. Must occur after irrigation and distribution efficiencies have been improved or at least clear plan in place which clearly will work.	WS	Sep10	EPA & others understand need for exporting salty water
	EPA and other relevant bodies approve in principle for trial or pilot discharge of salty water either for reuse in BRIA, disposal to river/sea or into ponds	GJ	Dec10	EPA & others approve the export of salty water
	Implement pilot of trial discharge	GJ	Dec11	Pilot commenced
	Evaluate success of trial at decreasing groundwater levels and salinity in BRIA groundwater system with no adverse impacts on environment. If this can be shown, proceed to next action	GE,GJ	Dec13	Trial evaluated & decision made on success & future action
	Review yearly	GJ	Dec13	Yearly review
5.Communication strategy	Develop communication strategy • The extension and communication strategy is currently being developed. A draft of this is listed below and this will be finalised in September 2009.	WS	Sep09	Strategy developed
	Communicate the problem of rising groundwater and salt levels in BRIA groundwater to key stakeholders. Send strong message that BRIA will be stuffed within 5 years if we do nothing	DS	Dec09	Communication completed &
	Do yearly communication of progress to fixing the groundwater problem to key stakeholders	DS	Dec13	Yearly communication of progress
6. Monitor salt and water levels	Determine water and salt levels in each section of BRIA at Dec 2008 • This monitoring work has been undertaken quarterly for years and is ongoing	WS	Mar09	Targets set
	Undertake study to determine what will happen if we do nothing re rising groundwater and salt levels in BRIA groundwater. Also, current situation. Utilise NRW groundwater planning re WRP/ROP and NRW salt hazard maps. Potential NRW new person to look at socio economic study and impact and potential water model upgrade. Seek CRC funding • Given the funding cuts at the Queensland government post the election, it is unlikely that DERM will be able to put on a person to undertake this and other tasks including the item below. We will need to make a decision on what to do next in the coming months.	GJ	Jun09	Study completed
	Set targets of salt and water levels by section which may be different from current sections	GJ	Jun09	Maps done

	Undertake monitoring on a quarterly basis re salt and water levels by section and compare levels to Dec 2008	GJ	quarterly	Monitoring done & communicated

DS Dean Sgroi (BRIA Irrigators), WS Wayne Smith (Canegrowers Burdekin), GJ Gary Jensen (DERM),ED Eric Danzi (Canegrowers), GE Gary Everson (Sunwater), SC Scott Crawford (NQ Dry Tropics), RC Randall Cox (DERM), TV Ton Vanderbyl (Sunwater)

Extension and Communication Plan

What	**How**	**Who**	**When**	**Target**
Extension and Communication Plan	Irrigation Automation Project Launch • Article in Local Paper • Article in CANEGROWERS newsletter • Establish a website where growers and industry representatives can keep track of the project • Create a video to outline the projects aims • Video sent to growers on a CD	Suzie and Toni	November 09	Burdekin Growers
	On-going media • Write an article for the CANEGROWERS Magazine four times a year to look at the trials progress. • Continually up-date an online project guide.	Suzie and Toni	September 10	All industry stakeholders including state and federal agencies
	Complete SIRMOD modelling on 7 growers properties across the Burdekin	Toni	December 09	BRIA irrigators committee
	Use Cane Productivity Initiative Groups around the farms that have completed SIRMOD modelling to discuss the SIRMOD results, the 12 hour plan and the system automation project.	Toni and BRIA irrigators committee members	September 10	Burdekin Growers
	Field day- 3 field days will be held on the automation site throughout the trial	Toni and Callum	September 10	Burdekin Growers

Automation of Furrow Irrigation project

What	How	Who	When	Target
1. Milestone 1	Sign Automation of Furrow Irrigation contract	Callum and Eric	Sept 09	Agreed plan for project

2. Milestone 2	Meeting with the BRIA Irrigators committee	Callum and BRIA Irrigators Committee	Sept 09	
	Purchase equipment	Callum	ASAP	
	Instrument site and grower training	Callum and grower	Nov 09	
	Field Day 'How the system works'	Callum and BRIA Irrigators Committee	Nov 09	
	Review by BRIA Irrigators Committee	BRIA Irrigators Committee	Nov 09	
		Eric and BRIA Irrigators Committee	Nov 09	
3. Milestone 3	2nd Field Day 'system in operation'	Callum and Toni	Dec 09	
	3rd Field Day 'final results'	Callum and Toni	May 10	
	Final Report and Evaluation	Callum and BRIA Irrigators Committee	June 10	
		Eric and BRIA Irrigators Committee	June 10	

Toni Anderson BSES, Suzi Moore Canegrowers Queensland, Callum Row Irrigation consultant

3. A commitment obtained from the director general of DNRW and CEO of Sunwater to implement this plan for managing groundwater with agreed timelines in consultation with the key local stakeholder groups.
   A commitment has been received by DERM and Sunwater in signing off the groundwater plan in March 2009. Since this time, considerable effort has been undertaken by both DERM and Sunwater to implement the plan especially in areas that they are responsible for under the plan. At this point in time, there is little doubt that DERM and Sunwater's commitment in signing off the plan has been reflected in actions in implementing the plan and I hope this continues over the next decade.

4. Final report to include an evaluation of changes in knowledge, attitudes and aspirations related to the project issues by all key decision makers and senior managers involved in irrigation and groundwater management across the Burdekin.

   When the project began very few people were aware of the magnitude of the problem regarding rising groundwater levels in the BRIA. A small group of growers in the BRIA were very much aware of the problem and had been for decades in some cases. Decades after trying to make others equally aware of the problem so action would be taken they were very frustrated. A number of sugar industry people including researchers, extension and policy people were also aware of the issue. There were also some government staff in DERM in north Queensland who were aware of the problem.

   However when the project started, most people did not understand the magnitude of the problem. Most growers could not see the problem on their own farm and thus took a lethargic approach. Also, they believed that government sold them the land and water so if a problem was to occur it would be up to government to fix the problem and pay for it.

   Sunwater did not seem to understand the magnitude of the problem when the project started. They seemed to have the view that it was their responsibility to deliver surface water to farmers not manage the groundwater so no problem existed from their prospective. DERM in Brisbane did not seem to understand the problem to any extent and did not see it a priority to do anything until it became a major political disaster requiring urgent attention.

   Since the beginning of the project all the uninformed people above have been convinced of the major problem that exists with the rising groundwater in the BRIA. This has occurred due to the project and also since the BRIA has had 2 major floods in the past 2 years. This has meant that the steady rise in groundwater levels due to irrigation spiked causing water levels to come to around 0.5m of the surface in some places.

   Most growers have got the message that there is a major problem and they do need to act and take some responsibility for fixing the problem. Most growers understand that in the next 5 years there is a real risk of lost production on their farms if they do not act.

   Sunwater also has got the message both in the Burdekin and in Brisbane. If the problem is not fixed then their prime irrigation scheme is destined to fail. They also understand that around half the problem of rising groundwater levels is due to leakages from their distribution and drainage system. So they need to do something to stop reduce their losses for their scheme to continue to prosper.

   DERM in Brisbane also finally got the message though it has taken some of the staff a long time to realise it. However, they are not as keen to fix the problem as others since it is not a major political disaster yet. But they are prepared to support change and do their part in the solution.

5. Joint communication of project outputs and outcomes to all key stakeholders throughout the Burdekin

   John Williams was a consultant employed to undertake a study to give a comprehensive analysis of the current state of the BRIA groundwater system and make recommendations on what needed to be done to fix the problem. To finalise his report, John and his colleagues undertook extensive consultation with stakeholders. This included meeting with the BRIA Irrigators committee, growers in the Burdekin, the North and South Burdekin Water Boards,

the Lower Burdekin Water Futures Group, DERM both in north Queensland and Brisbane, SRDC and Sunwater both in the Burdekin and Brisbane.

The project is ongoing beyond the SRDC funding as articulated above. Ongoing activities are clearly listed above including a draft communication and extension plan. These activities are expected to continue for the next 3 or 4 years.

Future Research Needs:

The next phase of the project has already commenced and is about implementation of the plan developed in this project. There is a significant need for further funds for this to be successful. CANEGROWERS in currently investing in employing a consultant to develop an automated flood irrigation system for the BRIA as outlined previously in this report. This is due for completion in June 2010 and if it is successful we will be able to roll this out commercially to growers in the BRIA and encourage uptake. If there are significant issues with the automated system, we will require further funding to undertake an amended trial and project which would need to commence in July 2010.

We are currently seeking extension funding to encourage uptake of improved irrigation practices that would reduce the water losses to groundwater from irrigation.

Recommendations:

Recommendations for further steps are listed above in future research needs.

List of Publications:

Williams, J, Stubbs, T and Bristow, K, "Investigation of the water and salt balances of the Burdekin River Irrigation Area and their importance for strategic planning and institutional arrangements for the entire lower Burdekin", Weetangera Australia 2009.