

SRDC

ANNUAL REPORT

2013-2014



Investing in sugar research innovation



Australian Government

Sugar Research and Development Corporation

Sugar Research Australia Limited

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31 January 2014

The Hon. Barnaby Joyce MP

Minister for Agriculture
PO Box 6022
Parliament House
CANBERRA ACT 2600

Dear Minister

In accordance with the requirements of the *Primary Industries and Energy Research and Development Act 1989*, I submit a final annual report covering the last three months of the Sugar Research and Development Corporation's (SRDC) operations from 1 July 2013 to 30 September 2013.

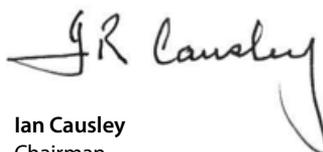
The activities of the Corporation are reported against the objectives, strategies, outputs and outcomes of the SRDC Research, Development and Extension Plan 2012-2017 and are consistent with the 2013-2014 Annual Operational Plan and the Portfolio Budget Statement. However, the short, three month reporting period and the focus during this period on activities associated with closure of the Corporation mean it is not appropriate for SRDC to report against the Portfolio Budget Statement key performance indicators and deliverables.

This Annual Report was prepared in accordance with a resolution of the Directors of SRDC at their Board Meeting on 30 August 2013. SRDC Directors are responsible under Section 9 of the *Commonwealth Authorities and Companies Act 1997* for the preparation and content of the report of operations in accordance with the Finance Minister's Orders.

The SRDC is confident that operations and transition activities delivered in the first quarter of 2013-2014, meet the requirements of the PIERD Act and instructions provided by the Department of Agriculture relating to the closure of an Australian Government Statutory Authority. The activities also aligned with the provisions outlined in the Sugar Research and Development Services (Consequential Amendments and Transitional Provisions) Act 2013.

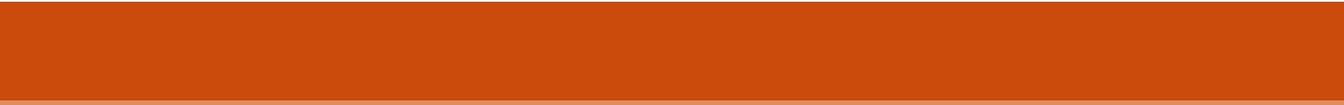
I commend this report to you.

Yours sincerely



Ian Causley
Chairman

Sugar Research and Development Corporation



SRDC

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2013–2014

Final Annual Report
1 July 2013 – 30 September 2013



Australian Government

Sugar Research and Development Corporation

Investing in sugar research innovation



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Section 1

Report from Chairman
and Executive Director
Industry facts and
statistics



REPORT FROM CHAIRMAN AND EXECUTIVE DIRECTOR

This is the final report of the Sugar Research and Development Corporation (SRDC) which closed on 30 September 2013 after twenty-three years as an Australian Government Statutory Authority.

On 28 June 2013, Bills that provided the mechanism to implement key elements of restructuring proposals for sugar research and development organisations were passed by the Australian Parliament and received Royal Assent on 29 June 2013.

On 5 August 2013, the then Minister for Agriculture, Fisheries and Forestry, the Hon Joel Fitzgibbon MP, declared Sugar Research Australia Limited (SRA) the new industry services body for the sugarcane industry.

Subsequently, SRDC's current and previously approved Research, Development and Extension (RD&E) projects were transferred to SRA for management. SRDC also facilitated the transfer of the Corporation's assets and liabilities and ensured all business activities of the Corporation were wound up in line with prescribed closure date.

This Final Annual Report covers the last three months of operations of the SRDC from 1 July 2013 to 30 September 2013. The report was prepared in accordance with the requirements of the *Primary Industries and Energy Research and Development (PIERD) Act 1989*, and follows advice from the Department of Agriculture regarding procedures for closing a Statutory Authority, and the requirements of the Sugar Research and Development Services (Consequential Amendments and Transitional Provisions) Act 2013.

The SRDC Board and staff were actively involved in transition planning and implementation.

In April 2013, the SRDC Board established a Board Transition Sub-Committee, including two SRDC Board members, Dr Kleanthes Yannakou and Mr Jay Venning, and the Executive Director, Ms Annette Sugden, to oversee the activities associated with proposed closure of SRDC.

From 1 July 2013, an operational team comprising four staff members and two short term contractors implemented a *Closure and Transition Plan* in consultation with the Board Transition Subcommittee, the Board Chairman, SRA, and the Australian Government.

The *Closure and Transition Plan* focused on the following elements:

- Informing SRDC's stakeholders and suppliers of the forthcoming closure of SRDC on 30 September 2013 and establishment of SRA.
- Continuing management of RD&E projects and milestones from 1 July to 5 August 2013, and then transfer of all project files to SRA in digital format for future management.
- Completion of an audit of financials and operations for 2012–2013 and submission of an Annual Report to the Minister for approval and Tabling in Parliament.
- Completion of an audit of financials and operations for the three month period 1 July to 30 September 2013 and submission of the 2013–2014 Annual Report to the Minister for approval.
- Ensuring a copy of the SRDC website, specified governance records and final RD&E project reports were provided to the National Library of Australia, National Archives, Pandora, Department of Agriculture, and SRA, in accordance with Archive Disposal Authorities and administrative requirements.
- Liaison with SRA staff and SRDC suppliers to ensure issues were identified and addressed, and all wind up activities were completed.

On behalf of the SRDC Board and team, we wish to acknowledge the tremendous work undertaken for industry, government and the community by talented researchers and scientists from Australia and overseas. Their innovative and world class research created significant breakthroughs for the Australian sugarcane industry and improved the overall sustainability of the industry.

REPORT FROM CHAIRMAN AND EXECUTIVE DIRECTOR

Without the researchers', growers' and millers' active involvement in SRDC's programs and their willingness to drive the Australian sugarcane industry into a sustainable future, SRDC would not have been able to achieve what it has in its 23 years of operation.

We would also like to acknowledge the commitment and dedication of SRDC staff, who managed RD&E projects and program activities to the highest standard and maintained communications with industry and government, despite the trying conditions during the closure of the organisation. Of particular note was the work of Ms Christine Ipson who was the first SRDC staff member and who has provided high calibre Executive Support services throughout the life of the organisation.

Although none of the SRDC team will be continuing with SRA, we will eagerly watch the expansion of the industry as a result of advances made by SRA and wish the new team all the best in the future.



A handwritten signature in black ink that reads "I R Causley".

IAN CAUSLEY
SRDC Chairman



A handwritten signature in black ink that reads "A Sugden".

ANNETTE SUGDEN
Executive Director

INDUSTRY FACTS AND STATISTICS



Table 1.0
Australian Sugarcane Production Statistics

<i>Value of Production</i>	<i>Forecast 2013–2014</i>
Cane crushed (million tonnes)	30.5
Cane farm business (ABN)	4,465
Average yield of cane crop (tonnes per ha)	85
Sugar mills in Australia	24
Bulk sugar storage ports	6
Annual sugar production (tonnes IPS)	4.5 Mt
Export volume	3.2 Mt
Export value of sugarcane crop production (\$AUS)	\$1.5 billion

<i>Cane production by region (tonnes)</i>	<i>Forecast 2013–2014</i>
Northern region	6.5 Mt
Herbert and Burdekin region	11.3 Mt
Central region	7.8 Mt
Southern region	3.5 Mt
NSW region	1.4 Mt
Total	30.5 Mt

Statistics provided by ASMC and map redrawn from an industry map provided by Canegrowers.



Cane growers view Natalie Moore's (NSW Department of Primary Industries) soybean trial on a NSW cane farm during a grower tour.

Section 2

Introducing SRDC
SRDC collaboration
SRDC people
SRDC governance
SRDC staff
SRDC business
SRDC finance



CSIRO Senior Research Scientist Dr Rosanne Casu works with an automated pipetting robot at the CSIRO Plant Industry labs. Dr Casu is involved with the Sugarcane Genome Team that was awarded the Research Team Innovation Award in 2012.

The Sugar Research and Development Corporation (SRDC) was a Statutory Authority of the Australian Government, established under the Primary Industries and Energy Research and Development Act 1989 (the PIERD Act).

SRDC's role was as a research, development and extension (RD&E) investment body and partner, drawing on funds provided by both the sugarcane industry and the Australian Government.

SRDC obtained income from levies paid by the sugarcane industry, matching funds from the Australian Government, interest and royalties.

Until 1 July 2013, the sugar industry research and development (R&D) levy was \$0.14 per tonne of sugarcane payable on sugarcane that was produced in Australia and accepted at a sugar mill for processing for the purpose of producing raw sugar. This levy was divided equally between growers and millers. The Australian Government contributed matching funds up to a limit of 0.5 per cent of industry Gross Value of Production (GVP) averaged over three years.

On 5 August 2013, Sugar Research Australia Limited entered into a Statutory Funding Agreement with the Commonwealth and was declared the sugar industry services body by the then Minister for Agriculture, Fisheries and Forestry allowing it to receive industry levies and the matching Commonwealth payment. Under the sugar industry RD&E restructure, the statutory R&D levy was increased to \$0.70 per tonne of sugar cane that is processed, or sold for processing, to be paid equally (35 cents per tonne each) by growing and milling businesses.

Vision

The SRDC was committed to setting the right targets for RD&E investments; to making sound investment decisions that addressed those targets using rigorous transparent processes; to managing investments so that they succeeded; and to ensuring that RD&E delivered outcomes for its stakeholders and built capacity for change, learning and innovation across the industry.

Mission

SRDC's mission was to foster an innovative and sustainable Australian sugarcane industry through targeted investment in research, development and extension.

Corporate Outcome

SRDC's Corporate Outcome was: a profitable and internationally competitive and sustainable Australian sugarcane industry providing economic, environmental and social benefits for rural and regional communities through targeted investment in research and development.

Priorities

As outlined in SRDC's RD&E Plan 2012–2017, SRDC worked across four program priority areas:

- **Growing the Crop:** A profitable and market driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane.
- **Milling the Crop:** A profitable milling sector utilising new and improved technologies and processes.
- **Sustaining the Environment:** Coordinate, facilitate and extend, as appropriate, existing environmental stewardship programs.
- **Skills and Capabilities:** An industry committed to supporting a culture of education, learning and innovation.

Accountability to stakeholders

The SRDC was accountable to both the Australian Government and industry representative organisations. The *Primary Industries (Excise) Levies Regulations 1999* defined these representative organisations, known to the industry as Representative Bodies, as:

- Australian Cane Growers Council Limited (ACGC) represented by Queensland Cane Growers Organisation Limited – known as Canegrowers
- Australian Cane Farmers Association Limited (ACFA)
- Australian Sugar Milling Council Proprietary Limited (ASMC)

Industry restructure

In September 2012, the Australian Sugar Industry Alliance submitted a proposal to the Australian Government supporting the establishment of a new industry owned company.

The proposal advocated the closure of the industry's research investment agency, SRDC, and the industry's key research provider, BSES Limited, and establishment of a single entity, Sugar Research Australia (SRA) which would undertake both investment and research. Also proposed was the transfer of research coordination activities undertaken by the milling research consulting body, Sugar Research Limited, to SRA.

A poll of sugarcane growers and millers held in August 2012 supported this proposal.

In April 2013, the SRDC Board established a Transition Sub-Committee, including two Board members, Dr Kleanthes Yannakou and Mr Jay Venning, and the Executive Director, Ms Annette Sugden. The Sub-Committee continued until the closure of SRDC on 30 September 2013.

The Sugar Research and Development Services Bill 2013 and its companion bills, which provided the mechanism to implement the proposed restructure, were passed by the House of Representatives on 19 June 2013, and the Senate on 28 June 2013 and received Royal Assent from the Governor-General, Her Excellency the Honourable Quentin Bryce AC CVO, on 29 June 2013.

The bills imposed the new sugar research and development levy and defined the arrangements for transition of SRDC's assets and liabilities to a new industry owned company.

On 1 July 2013, SRDC commenced implementation of the *Closure and Transition Plan* to:

- prepare for the wind up of operations
- facilitate the transfer of project records from SRDC to SRA, and governance records to the National Archives of Australia and the Department of Agriculture, Fisheries and Forestry
- ensure stakeholders were aware of the forthcoming changes.

On 5 August 2013, the then Minister for Agriculture, Fisheries and Forestry, Hon Joel Fitzgibbon declared SRA as the industry services body for the sugar industry and the transfer of assets and liabilities commenced.

Responsible Minister

SRDC was accountable to the Australian Government through the Minister for Agriculture. The Minister for Agriculture on 30 September 2013 was the Hon Barnaby Joyce MP.

Enabling legislation

The SRDC was established under the PIERD Act on 1 October 1990 as an Australian Government Statutory Authority, it was also subject to the *Commonwealth Authorities and Companies Act 1997* (CAC Act).

The objects of the PIERD Act are to make provision for the funding and administration of R&D relating to primary industries with a view to:

- increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries
- achieving the sustainable use and sustainable management of natural resources
- making more effective use of the resources and skills available in the community in general, and in the scientific community in particular
- improving accountability for expenditure on research and development activities in relation to primary industries.

The SRDC contributed to the objects of the PIERD Act by employing an investment approach that incorporated each legislative object and set key performance criteria to provide a framework for reporting and accountability.

The PIERD Act established the functions of the SRDC as being:

- to investigate and evaluate the requirements of the sugar industry for RD&E, and on the basis of that investigation and evaluation, to prepare an RD&E Plan, and to review and revise the plan
- to prepare an Annual Operational Plan for each financial year
- to coordinate or fund the carrying out of RD&E activities that are consistent with the Annual Operational Plan prepared by the Corporation and in force at the time
- to monitor, evaluate and report to the Parliament, the Minister and its representative organisations on RD&E activities that are coordinated or funded, wholly or partly, by the Corporation
- to facilitate the dissemination, adoption and commercialisation of the results of research and development for the sugar industry
- to implement other functions conferred on the Corporation by this Act or any other Act.

General policies of the Government

- Under the CAC Act, the Minister is empowered to notify the SRDC Board of Directors of any general Australian Government policies requiring implementation.

Rural Research and Development Corporation Model

The features of the Research and Development Corporation (RDC) model are:

- the RDCs take a leading national role to plan, investigate and manage RD&E for their respective industries
- RDCs are not research 'grant' agencies. Their enabling legislation requires them to treat RD&E as an investment in economic, environmental and social benefits to their industries and to the people of Australia
- RDCs strive to deliver high rates of return on RD&E investment by influencing the full range of interactions along the innovation chain, rather than focusing mainly on generating new knowledge for its own sake
- striving for high returns on investment also leads RDCs to apply significant resources to translating research outputs into practical outcomes
- RDCs are required to conduct their activities in accordance with strategic RD&E Plans and Annual Operational Plans that take account of the RD&E needs of end-users and other stakeholders. The plans are approved at ministerial level
- although RDCs fund basic research, a high proportion of activity is applied to collaborative RD&E projects with both short-term and long-term benefits
- RDCs are fully accountable to their major stakeholders and to the wider community.

All rural research and development corporations endorse the National Primary Industries Research, Development and Extension Framework – a partnership between industry representative bodies, key research and development stakeholders, State and Australian Governments that supports both commodity-specific and cross-industry RD&E strategies.

SRDC's Five Year Plan 2012–2017 and Annual Operational Plan 2013–2014 address the sugarcane industry's National Sugarcane Industry Research Development and Extension Strategy objectives and priorities as part of a wider analysis of industry and government priorities.

Rural Research and Development Corporations (RDCs)

Australia's productivity growth puts the nation in a strong position to meet the growing global demand for primary industry products. This growth is driven by investment supporting innovation in research, development and extension (RD&E) and generated by the RDCs.

There are 15 RDCs represented by the Council of Rural Research and Development Corporations (CRRDC) that prioritise, coordinate and integrate the needs and requirements of industry and government with the capabilities of research providers.

The RDCs invest around \$500 million a year in RD&E to improve the profitability and sustainability of rural industries and communities.

RDCs are funded primarily by industry levies and Australian Government contributions on a matching basis up to a limit of 0.5 per cent of industry Gross Value of Production (GVP).

They promote effective research, development, innovation and extension of research findings in priority areas such as climate change and natural resource management. The ability to tackle projects jointly increases efficiency and results in more effective communication and uptake of the outcomes, contributing directly to the growth in productivity in Australian agriculture.

The RDCs embrace the Australian Government's National and Rural R&D Priorities in their investment, evaluation and reporting frameworks. Alignment with these priorities is a key consideration when setting strategic directions and making investment decisions.

In June 2013, the Australian Government's National Research Priorities were replaced by 'strategic research priorities'. Due to the short timeframe of this report and the fact that SRA was proclaimed the industry services body from 5 August 2013, no report has been included against these priorities. SRA will report against these priorities in its 2013–2014 Annual Report.

SRDC Board

The SRDC Board of Directors is responsible for the stewardship of the Corporation and oversees corporate governance. Its functions include: establishing goals, setting strategic direction, approving the annual budget, developing and approving a five-year R&D plan and ensuring that resources are allocated to address priority issues effectively through an Annual Operating Plan.

The Chairman of the Sugar Research and Development Corporation is the Hon. Ian Causley. From 1 July 2013 to 30 September 2013 the SRDC Board included the Chairman, five Non-Executive Directors: Dr Paul Donnelly, Ms Lindy Hyam, Mr Julian (Jay) Venning, Dr Kleanthes (Anthos) Yannakou, Dr Tracy Henderson, and the Executive Director, Ms Annette Sugden.

Directors, other than the Executive Director, serve on the Board for a term not exceeding three years, and must have experience in one or more of the following fields of expertise: commodity production; commodity processing; commodity marketing; conservation of natural resources; management of natural resources; science; technology and technology transfer; environmental and ecological matters; economics; administration of research and development; finance; business management; sociology; or public administration.

With the Chair's approval, Directors may obtain independent professional advice, at the SRDC's expense, on matters arising in the course of their Board and Committee duties.

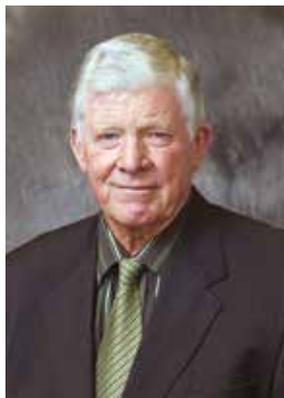
The roles and responsibilities of members of the Board, their code of conduct and SRDC policies and procedures were detailed in the SRDC's Business Process Management System (BPMS). This system was available via an internal intranet site and all SRDC employees and Directors were required to become familiar with the BPMS at the commencement of employment and to refer to this during their work.

Role of SRDC Board during transition period

From 5 August to 30 September 2013, the role of the SRDC Board was to support the implementation of the *Closure and Transition Plan*, approve the SRDC Annual Report 2012–2013 and audited financial statements, and support the Executive Director to close the Corporation in accordance with directives from the Department of Agriculture and as outlined in the PIERD Act and in the Sugar Research and Development Services (Consequential Amendments and Transitional Provisions) Act 2013.

The SRDC Board and Chairman will continue to serve after the SRDC office closes on 30 September 2013, with their sole functions being to approve audited financial statements for the period 1 July to 30 September 2013, approve the Management Representation and Directors Representation letters and approve the Final Annual Report for the period 1 July to 30 September 2013.

SRDC Directors 2012–2013



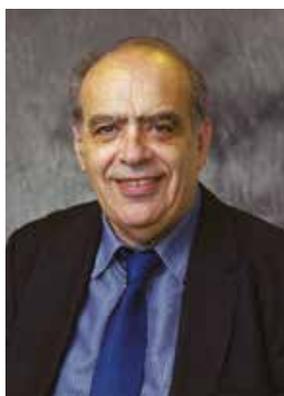
Hon Ian Causley – Chairman

Appointed 1 October 2010 for a three year term.

SRDC Chairman, Mr Ian Causley, has a distinguished career in politics and grassroots knowledge of the sugarcane growing and milling industry.

Mr Causley has a long history of representing the interests of sugarcane growers and millers. At age 26 years, he was appointed to the Clarence River Canegrowers Executive and became president 10 years later. He became a Director of the NSW Sugar Milling Co-operative in 1978 and appointed Chairman in 2009.

Mr Causley's political career began in 1984 when he was elected to the NSW Parliament and served seven years in Coalition ministries. In 1996 he entered Federal Parliament to lead several committees before taking on the role of Deputy Speaker until he retired in 2007.



Dr Kleanthes (Anthos) Yannakou – Deputy Chairman

B.Eng, MBA, PhD (Engineering – University of Pretoria)

Appointed 27 May 2011 for a three-year term.

Dr Yannakou is a consultant for private and government sector organisations in innovation, research and development, strategy and sustainability issues. Dr Yannakou has held senior positions including CEO of Food Science Australia, Chair of the CSIRO International Council and the Chief Scientist (Food Manufacturing) for the Department of Primary Industries, Victoria.

On 15 June 2011 Dr Yannakou was appointed Convenor of the SRDC Audit Committee, Deputy Chair in June 2013, and a member of the Transition Sub-Committee in April 2013.



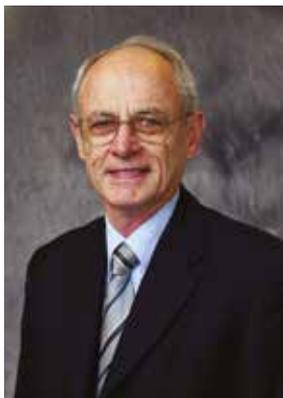
Mr Julian (Jay) Venning – Director (Non-Executive)

B.Eng (Chem)

Appointed 27 May 2011 for a three-year term.

Mr Venning is Group Production Engineering Manager for Wilmar Limited, Australia's largest sugar processor.

Mr Venning has more than 30 years experience in the sugar industry, in milling operations, operations management, project development and technical management and support. Mr Venning was a member of the SRDC Board's Audit Committee and in April 2013 was appointed to the Board's Transition Sub-Committee.



Dr Paul Donnelly – Director (non-executive)

DPhil, B Agric Sci.

Appointed 27 May 2011 for a three-year term.

Dr Donnelly has a career history in rural research, development and extension in the fields of dairy, horticulture, and grape and wine. With a special interest in farming systems, biotechnology, use of fibrous residues and the environment and sustainability, Dr Donnelly is keen to contribute to making the process of research to commercialisation more efficient. Dr Donnelly was a member of the Scholarship Committee and was a member of the Australian Sugar Industry Alliance's Interim SRA Sub-Committee. He is also a member of SRA's Research Funding Panel.



Ms Lindy Hyam – Director (non-executive)

MBA, B.Ed and Dip Teach FAICD

Appointed 27 May 2011 for a three-year term.

Ms Hyam brings skills in business management and research and development leadership gained through roles such as General Manager of the City of Newcastle, Chief Executive Officer of Plant Health Australia, and Executive Director of the Horticulture Research and Development Corporation. Ms Hyam is currently the General Manager of Singleton Council, NSW. Ms Hyam was previously a Non-Executive Director of the Rural Industries Research and Development Corporation, the Kip McGrath Education Centre, C. Management Services (wholly owned by Central Queensland University) and of the Crown Research Institute for Horticulture and Food, New Zealand. Ms Hyam was a member of the Board's Audit Committee.



Dr Tracy Henderson – Director (non-executive)

BAppSc, GDip (Econ), PhD

Appointed 27 May 2011 for a three-year term.

Dr Henderson has extensive experience in research strategy, management and evaluation and is a former consultant, academic and research manager. Dr Henderson was awarded a PhD in Agricultural Research and Development Evaluation from the University of Queensland in which she developed a strategic evaluation framework to manage and improve the performance of sugar research. Dr Henderson was formerly a Federal Councillor of the Australian Agricultural and Resource Economics Society and most recently worked with CSIRO Planning, Performance and Evaluation and managed the Impact 2020 Project. Dr Henderson was Convenor of the SRDC Scholarship Committee.



Ms Annette Sugden – Executive Director

B App Sci (App Geo); Grad Dip App Sci (Res Man); Master Sust Man; ALIA

Appointed 28 May 2010

Ms Sugden was appointed SRDC Executive Director in 2010 after working as SRDC's Senior Investment Manager. Tertiary qualified in natural resource management and sustainable management, highlights of her career in the primary industry sector include the management of the deer, pasture seed, fodder crop, and organics research and development programs within the Rural Industries Research and Development Corporation, and management of the Australian Government's Farm Innovation Program, the Rural Financial Counselling Service and the Southern NSW Regional Forest Agreement Social Assessment process. Ms Sugden was a member of the Board of the CRC for Sugar Industry Innovation in Biotechnology and Chairwoman of the Mackay Renewable Biocommodities Pilot Plant Project Review Panel.

Meetings of the Corporation

From 1 July to 30 September 2013, the SRDC Board of Directors met once, on 30 August, and an Audit Committee Meeting was held on 26 August 2013. No Scholarship Committee meetings were held during this time, however the Transition Sub-Committee met on numerous occasions formally and informally, either in the SRDC Brisbane office, at Sugar Research Australia, or by teleconference.

Attendance of Directors at Meetings is listed in Table 2.0. Under Section 54 of the PIERD Act, a Director were required to disclose the nature of any pecuniary interest or conflict of interest in any matter being considered. Directorships held by Directors were also recorded in the Register of Declared Interests by Directors.

Table 2.0

Directors' attendance at Board, Audit and Transition Sub-Committee Meetings from 1 July to 30 September 2013

	Board Meetings held from 1 July to 30 September 2013	Board Meetings attended	Out of Session – Teleconference Board Meetings held from 1 July to 30 September 2013	Out of Session – Teleconference Board Meetings attended	Audit Committee Meetings held 1 July to 30 September 2013	Audit Committee Meetings attended	Transition Sub-Committee meetings held 1 July to 30 September 2013	Transition Sub-Committee meetings attended
Annette Sugden <i>Executive Director</i>	1	1	3	3	1	1 [#]	3	3
Ian Causley <i>Chairman</i>	1	1	3	3				
Anthos Yannakou <i>Deputy Chairman, Non-Executive Director, Convenor of Audit Committee and member of Transition Sub-Committee</i>	1	1*	3	3	1	1	3	3
Jay Venning <i>Non-Executive Director, Member of Audit Committee and Transition Sub-Committee</i>	1	1	3	3	1	1	3	3
Paul Donnelly <i>Non-Executive Director Member of Scholarship Committee</i>	1	1	3	3				
Tracy Henderson <i>Non-Executive Director Convenor of Scholarship Committee</i>	1	1	3	3				
Lindy Hyam <i>Non-Executive Director Member of Audit Committee</i>	1	1	3	2	1	1*		

On occasions the Chair of the SRDC Board granted permission for Board Directors to join a meeting via teleconference. Instances where this applies are denoted with a *.

[#] The Executive Director was invited to attend the Audit Committee Meeting in August 2013.

Board meeting dates July – September 2013

From 1 July to 30 September 2013, the SRDC Board Meetings were on the following dates:

- 8 July 2013 – SRDC Board Teleconference
- 19 July 2013 – SRDC Transition Sub-Committee Meeting, Brisbane
- 22 July 2013 – SRDC Transition Sub-Committee Teleconference.
- 15 August 2013 – SRDC Board Teleconference
- 16 August 2013 – SRDC Transition Sub-Committee Teleconference
- 26 August 2013 – SRDC Transition Sub-Committee Meeting, Brisbane
- 26 August 2013 – SRDC Audit Committee Meeting, Brisbane
- 30 August 2013 – SRDC Board Meeting, Brisbane

Audit Committee

The Audit Committee provided advice to the Board to assist it to fulfil its responsibilities relating to the accounting, reporting and compliance practices of the Corporation.

In 2013–2014, the Audit Committee comprised the Convenor, Dr Kleanthes (Anthos) Yannakou and Committee Members, Mr Jay Venning and Ms Lindy Hyam. Invitations to the 2013–14 Audit Committee Meeting were extended to the Executive Director, the Business and People Development Manager, and representatives of the outsourced accounting firm (Pricewaterhouse Coopers) and the external Auditor (HLB Mann Judd), to comment on and respond to queries on the 2012–2013 annual accounts. The Committee: reviewed audits by the Corporation’s external auditors; maintained presented by management; and reviewed the adequacy of the Corporation’s administrative, operating and accounting controls.

It also oversaw the management of risk including: the development of profiles and policies for the Corporation to assist in the management of fraud, corporate governance practice, and environmental issues.

Members of the Audit Committee from July to September 2013 were: Dr Kleanthes (Anthos) Yannakou (Convenor), Mr Jay Venning and Ms Lindy Hyam. The Audit Committee met on one occasion (26 August 2013).

Section 2

SRDC STAFF

The SRDC staff members were employed under Section 87 of the PIERD Act. During the first quarter of 2013–2014 the Corporation employed full-time, part-time and contract staff members in addition to the Executive Director. All were located at the SRDC office at Level 16, 141 Queen Street, Brisbane, Queensland.

On 4 July 2013, all SRDC staff were informed in writing that the Corporation would officially close on 30 September 2013 and that they would be made redundant as a result.

Four staff, Bianca Cairns, Ben Baldwin, Kathy Mitchell, and Melissa Creber left SRDC on 22 July 2013, and Peter Twine left on 30 August 2013.

The remaining five staff (Annette Sugden, Christine Ipson, Diana Saunders, Carolyn Martin and Sara Stuart (contractor) formed the transition team until SRDC closed on 30 September 2013. An additional contractor, Jean Antill, was employed for a short term. SRDC's accounts and finances were managed by an external accountant and auditor.

Equal employment opportunity

Staff were employed under terms and conditions consistent with the *Equal Employment Opportunity (Commonwealth Authorities) Act 1987* and SRDC's equal employment policy.

SRDC Gender Profile between 1 July to 30 September 2013:

	Male	Female
Board of Directors	4	2
Staff *	2	9

* Staff count includes the Executive Director and also includes two contractors. Only four staff and one contractor worked for the full three month period.

Left to right: Carolyn Martin, Ben Baldwin, Annette Sugden, Bianca Cairns, Dr Peter Twine and Dr Diana Saunders.



Work Health & Safety

The SRDC was committed to achieving and maintaining a safe, healthy and productive work environment for all staff, Board members, panel members, contractors and visitors to its workplace. The SRDC actively encouraged a teamwork approach, cooperation and good communication as the tools to build a safe working environment. It complied with the *Work Health and Safety Act 2011* and took all reasonably practicable steps to ensure a safe working environment.

Indemnities and Insurance Premiums

The Corporation took the necessary steps to ensure professional indemnity cover was in place for all Directors and officers. However, the Comcover insurance contract prohibits public disclosure of the nature or limit of the liability covered or the amount of premium paid. During the year one insurance-related claim (equipment damage) and no indemnity-related claims were made.

Commonwealth Disability Strategy Report

The SRDC was a small organisation. The Corporation rented office space in the Brisbane CBD and was limited by the prevailing building specifications and requirements in terms of access. Lift access and disabled toilets were provided in the building.

In its role as a research investment manager, the Corporation had a focus on the outcome of externally contracted research initiatives and was not responsible for the day-to-day management of the people engaged in that research.

As an employer, the Corporation complied with the policies, procedures and practices required by the *Disability Discrimination Act 1992*, as amended by the *Disability Discrimination and Other Human Rights Legislation Amendment Act 2009*.

During the first quarter of 2013 (1 July to 30 September 2013) the Corporation:

- did not review or revise any policy with an impact on people with disabilities;
- published all documents and compliance reports in accessible electronic and hard copy formats;
- ensured all events were conducted with due consideration for accessibility;
- did not engage in any purchasing or contractual arrangements that required compliance with the *Disability Discrimination Act 1992*.

Research Priorities

The SRDC used its five-year *Research and Development Plan 2012–2017* to guide its program investments. The Plan was developed with extensive industry, government and stakeholder consultation and was evaluated as part of the production of the AOP 2013–2014. The Corporation’s investments addressed the National Research Priorities, the Rural R&D Priorities of the Australian Government, industry and Ministerial Priorities and the National Sugarcane Industry Research, Development and Extension Strategy.

While the National Research Priorities were updated to become Strategic Research Priorities from June 2013, no assessment or investment against these priorities was undertaken by SRDC and no new investments were made in 2013–2014. A report against the new priorities will be undertaken by Sugar Research Australia in its assessment of investments undertaken in 2013–2014.

National Research Priorities

SRDC considered the four National Research Priorities in its selection of projects:

- an environmentally sustainable Australia
- promoting and maintaining good health
- frontier technologies for building and transforming Australian industries
- safeguarding Australia.

In 2012–2013, SRDC’s investment spread could be demonstrated by the table below and Figure 2.1, however no new investments were made in 2013–2014. Appendix A of the 2012–2013 Annual Report shows the proportion of investment against each priority area.

SRDC funded R&D projects by National Research Priority (per cent) in 2012–2013

National Research Priority	R&D projects linked by National Research Priority (per cent)
NRP 1 – Safeguarding Australia	15
NRP 2 – Frontier Technologies	51
NRP 3 – Promoting and Maintaining Good Health	9
NRP 4 – Environmentally Sustainable	25
TOTAL	100

Rural Research and Development Priorities

Complementing the National Research Priorities are the Rural Research and Development Priorities that focus on issues relevant to rural industries.

- **Productivity and adding value** – Improve the productivity and profitability of existing industries and support the development of viable new industries
- **Supply chain and markets** – Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the supply chain, including to consumers
- **Natural resource management** – Support effective management of Australia’s natural resources to ensure primary industries are both economically and environmentally sustainable
- **Climate variability and climate change** – Build resilience to climate variability and adapt to and mitigate the effects of climate change
- **Biosecurity** – Protect Australia’s community, primary industries and environment from biosecurity threats

Supporting priorities include:

- **Innovation skills** – Improve the skills to undertake research and apply its findings
- **Technology** – Promote the development of new and existing technologies.

As no new investments were made by SRDC in 2013–2014, the figures for 2012–2013 remained unchanged.

Allocation of SRDC funded R&D projects by Rural R&D Priority (per cent) in 2012–2013

Rural Research and Development Priority	R&D projects funded by SRDC and linked to Rural R&D Priority (per cent)
RRDP 1 – Productivity and Adding Value	31
RRDP 2 – Supply Chain and Markets	3
RRDP 3 – Natural Resource Management	8
RRDP 4 – Climate Variability and Climate Change	8
RRDP 5 – Biosecurity	13
RRDP 6 – Innovation skills (supporting priority)	21
RRDP 7 – Technology (supporting priority)	16
TOTAL	100

The investments against the Rural Research and Development Priorities and attributed to each program (\$'000) in 2012–2013 can be viewed at Appendix B of the 2012–2013 Annual Report.

Industry Priorities and directions from the then Minister for Agriculture, Fisheries and Forestry

In addition to the National and Rural R&D priorities, the SRDC was guided by industry priorities.

In 2013–2014, SRDC held no meetings with its Representative Bodies but did meet regularly with SRA representatives and staff. It received advice from the Minister for Agriculture, Fisheries and Forestry defining the passage of bills enabling the transition to SRA and actions required to close SRDC.

SRDC Outcomes, Deliverables and Inputs in the RD&E Plan

The SRDC RD&E Plan outlined four investment programs on which the RD&E portfolio was based. It nominated program outcomes and deliverables, and provided target ranges for the allocation of resources to the investment programs. The following diagram illustrates the relationships between SRDC's Corporate Outcome, Investment Program Outcomes, Deliverables and Inputs.

Table 2.1
Outcomes, outputs and inputs

Corporate Outcome	<i>A profitable and internationally competitive and sustainable Australian sugarcane industry providing economic, environmental and social benefits for rural and regional communities through targeted investment in research and development.</i>		
Investment Program	Outcomes	Deliverables	Inputs
Growing the Crop	A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane	Number of technologies, plant varieties, practices, processes and/or systems at the research, development and extension stage to: <ul style="list-style-type: none"> ■ Limit production losses from weeds, diseases and pests, including incursion threats ■ Increase the genetic potential of sugarcane and ■ Improve harvesting system relevant to the current economic drivers and requirements of the millers, growers and harvester operators. 	35–45%
Milling the Crop	A profitable milling sector utilising improved technologies and processes	Number of technologies, practices and/or systems at the research, development and extension stage to: <ul style="list-style-type: none"> ■ Improve processes and materials within sugar mills ■ Support the industry capacity to produce quality sugar to meet market needs ■ Development of market appropriate and optimum performance cane transport systems and ■ Maintain an awareness of, and facilitating where possible, value adding opportunities to the current use of the sugarcane plant and its co-products 	25–35%
Sustaining the Environment	Coordinate, facilitate and extend, as appropriate, existing environmental stewardship programs.	<ul style="list-style-type: none"> ■ Develop and implement an environmental stewardship program ■ Investigate product diversification/waste utilisation opportunities completed and ■ Undertake a longitudinal study of industry economic, environmental and social footprint. 	10–20%
Skills and Capabilities	An industry committed to a culture of education, learning and innovativeness.	Provide events, mentoring training, scholarships, information and industry group support (funds, guidelines and staff) to: <ul style="list-style-type: none"> ■ Increase farm and business managers and advisers' awareness, capacity and skills to identify improvements and adopt associated technologies and best practices ■ Fill identified RD&E skills gaps in the industry ■ Support people in leadership positions to enhance their capacity to drive the industry forward and ■ Develop and support effective relations across the value chain to drive the industry forward. 	10–20%

As SRDC was in wind down mode for the period July to September 2013, no assessment of outcomes, deliverables and inputs was undertaken.

Project investments

The SRDC supported a competitive approach to the commissioning of R&D to ensure a high return on investment. Each project proposal was assessed using an attractiveness and feasibility framework and scored from zero to five on each criterion, and expert reviewers from Australia and overseas used in conjunction with industry experts to ensure investments were both attractive and feasible. Emphasis was placed on partnerships between industry sectors and regions.

In 2012–2013 there were four categories of projects:

- research
- scholarships
- capacity building
- grower group innovation.

In 2012–2013 SRDC also commissioned research and contributed to a range of joint RDC investment projects. However, no new investment was undertaken in 2013–2014. Some milestone payments fell due in July 2013 and were paid prior to transfer of project related activities to SRA.

Table 2.2
Funding allocated across SRDC project types in 2012–2013

Project types as of 30 June 2013	No. of Projects 2012–2013	Projects funded by \$ ('000)	Proportion of funding (per cent)
Research	65	6,739	87
Student	19	460	6
Scholarship	18	276	4
Grower Group Innovation	16	117	1
Capacity Building	4	151	2
TOTAL funding of projects	122	7,743	100

Details on the funding allocated across SRDC project types, and project reports received by SRDC in 2012–2013 are outlined in Tables 2.3 and 2.4 of the 2012–2013 Annual Report.

The amount allocated for projects against each investment priority area in 2013–2014 is shown in Table 2.3 below, however some of the projects included in this table were not fully contracted upon transfer to SRA. Due to time constraints, no assessment was undertaken of the value of fully contracted projects before transfer occurred.

Table 2.3
Funding allocated across SRDC Investment Program (per cent)

Distribution of project funding by investment program	2012–2013	2013–2014
Growing the Crop	47	55
Milling the Crop	16.4	19
Sustaining the Environment	18.1	18
Skills and Capabilities	18.5	8
TOTAL percentage of projects funded	100	100

Corporate governance practices

The SRDC maintained a comprehensive Business Process Management System (BPMS) via an internal intranet site. This system outlined the roles and responsibilities of all employees, the code of conduct and defined business and governance practices. The suite of policies included topics relating to leadership; planning and reporting; accountability; management; financial control; risk management and monitoring.

In 2013–2014, no reviews or audits of policies were undertaken and no new policies were developed.

SRDC Monitoring, Evaluation and Reporting

SRDC Research Development and Extension Plan 2012–2017 (RD&E Plan)

The five-year SRDC RD&E Plan outlined the strategies and performance measures to provide a monitoring and measuring framework for corporate performance. It was to be reviewed annually, to ensure it defined core business, indicated broad priorities for RD&E and defined the strategy to achieve outputs and outcome. 2012–2013, was the first year of implementation of the SRDC RD&E Plan and with the impending closure of SRDC, no assessment of performance against this Plan was undertaken.

Measuring economic, environmental and social returns from RD&E investment

In 2012–2013, the Council of Rural Research and Development Corporations reviewed and improved the methodology for completing triple-bottom-line impact assessments.

SRDC collaborated with other RDCs to undertake a review using this methodology to assess the social, economic and environmental returns of investment and any significant public-good components that may benefit the community.

The evaluation enabled the RDCs to make better investment decisions, report outcomes to industry and government stakeholders and improve the performance of RD&E projects. In the impact assessments undertaken by SRDC in 2012–2013, the benefits were described in a triple bottom line framework. Some of the potential benefits were then valued in monetary terms.

SRDC did not participate in this assessment in 2013–2014.

Annual Operational Plan (AOP)

This Plan specified the broad groupings of RD&E activities that the SRDC proposed to fund during the 2013–2014 financial year together with an estimate of income and expenditure. The AOP was approved by industry representative bodies and sent to the Minister for approval and distribution to all government stakeholders. However the AOP was not published and not distributed.

Portfolio Budget Statement

The Portfolio Budget Statement released in May 2013 provided a summary of SRDC's outcomes, outputs, performance and financial position for the past year and coming years. The statement was consistent with the SRDC Research and Development Plan (2007–2012) and the AOP and was tabled in Parliament in May. No assessment of progress against the Portfolio Budget Statements was undertaken in 2013–14 due to the wind up process in place.

Annual Report

The Annual Report was the principal formal accountability document. It reported on the achievement of the performance targets; detailed actual performance; and forecasted future needs and expectations. It was also a key reference document and formed part of an historical record for the Corporation. All SRDCs Annual Reports are held by the National Library of Australia and the National Archives of Australia and SRA.

Section 2

SRDC FINANCE

Industry levy rates

Until 5 August 2013, SRDC was funded by levies from industry, with matching Australian Government contributions up to 0.5 per cent of the GVP, averaged over three years. Levies were imposed under Schedule 24 of the *Primary Industries (Excise) Levies Act 1999* and collected under the *Primary Industries Levies and Charges Collection Act 1991*. In 2012–2013 the levy remained at \$0.14 per tonne of sugarcane crushed, divided equally between growers and millers.

Under the sugar industry RD&E restructure, the statutory R&D levy was increased to \$0.70 per tonne of sugar cane that is processed, or sold for processing, to be paid equally (35 cents per tonne each) by growing and milling businesses.

Table 2.6

Statutory R&D levy rates from 1990 to 2013

From	To	Levy rate (\$/tonne)
1 August 1990	31 May 1992	0.06
1 June 1992	30 September 1992	0.10
1 October 1992	31 August 1995	0.14
1 September 1995	30 April 2001	0.15
1 May 2001	31 March 2002	0.12
1 April 2002	30 June 2013	0.14
1 July 2013		0.70

Income and expenditure

The SRDC's actual income and expenditure for 2013–2014, compared with that forecast in the AOP 2013–2014, is set out in Table 2.7.

Table 2.7

SRDC actual income and expenditure 2013–2014 based on AOP forecast

SRDC Budget	Estimated budget AOP 2013–2014	Actual budget 1 July to 30 September 2013
Estimated crop size (cane for crush)	31 Mt	30.5 Mt
Estimated gross value of production (2013–2014)	1,000	1,000*
Levy rate = cents/tonne	\$0.14	\$0.14
Income	\$m	(\$m)
Industry contribution	4.340	0.018
Australian Government contribution	4.340	0
Interest and other	0.437	0.099
TOTAL INCOME	9.117	0.117
Expenditure	\$m	(\$m)
Total projects ¹	8.235	0.261
Operation of SRDC ²	2.115	8.581
TOTAL EXPENDITURE	10.350	8.842

1 Total projects includes the costs related to Section 33(1) (d) and 33(1) (da) of the PIERD Act concerning levy collection and management expenditure payable to the Commonwealth. In 2012–13 the levy collection fee was \$14,220.

2 Operation of SRDC includes estimates for Section 33(1) (c) of the PIERD Act concerning remuneration of directors and committee members. Total board expenses in 2012–13 were \$287,505.

* This figure also includes payments to SRA, employee benefits, payout of suppliers, depreciation and amortisation. No leave or redundancy expenses were recorded for the period 1 July to 30 September 2013 as provision for this was included in the previous financial year.

Income explanation

No Commonwealth funding was received from the Government for the period from 1 July 2013 until closure of the Corporation on 30 September 2013. Until 5 August 2013, the Corporation was still legislated to receive industry levies in accordance with the *Primary Industries (Excise) Levies Act 1999* and the *Primary Industries Levies and Charges Collections Act 1991* until the signing of the *Statutory Funding Agreement 2013–2017* between the Commonwealth and Sugar Research Australia. A final industry levy payment of \$18,434.55 was received on 24 July 2013 covering the period 1 July to 17 July 2013.

Expenditure explanation

Cash assets totalling \$7,279,858 were transferred to Sugar Research Australia between 1 July and

30 September 2013. Funds remaining in the Corporation's account on 1 October 2013 were also transferred to Sugar Research Australia after closure. A provision for make good and reparation of the tenancy after the closure of the organisation was included in the accounts as a prepayment.

As the Statutory Funding Agreement was not signed until 5 August 2013, SRDC was required to continue payments for project milestones falling due before that time. Payments totalling \$261,000 were made against milestone reports received. Provision was included in the 2012–2013 financial statements for redundancy and leave payments. These accounts reflect standard employee benefits.

Table 2.8 summarises the actual income and expenditure over the past five years.

Table 2.8

Annual Budgets at a glance (\$m) (at 30 September 2013)

Budget (\$m)	2013–2014	2012–2013	2011–2012	2010–2011	2009–2010	2008–2009	2007–2008
Revenue	0.117	9.255	10.015	10.391	10.444	11.093	12.158
Expenditure	8.842	10.234	10.043	10.226	9.785	10.252	11.093
Operating surplus/ (deficit)	(8.725)	(0.979)	(0.028)	0.165	0.659	0.841	1.065
Total assets	1.541	11.158	11.735	11.776	11.516	11.097	11.273
Total equity	1.541	10.266	11.245	11.272	11.108	10.449	9.608
Industry contributions	0.018	4.341	3.854	3.823	4.136	4.317	5.028
Australian Government contributions	0	4.341	5.353	5.867	5.817	6.110	6.283
R&D expenses*	0.261	7.757	8.107	8.182	7.764	8.292	9.139

* R&D expenses include amounts associated with the payment of contracted milestones and the levy collection fee.

Financial management and auditing

The SRDC maintained accounts and records of transactions in accordance with accepted accounting principles. Financial statements were prepared in accordance with Schedule 1 of the CAC Act and Australian Equivalents to International Financial Reporting Standards.

Financial statements and cash flow forecasts were prepared monthly and discussed quarterly at each Board Meeting. Following the annual external audit

of the Corporation's 2013–2014 financial accounts, the Executive Director presented a draft Management Representation Memorandum to the Board for final adoption of the Annual Financial Statements. The Board will approve the Annual Financial Statements, a Management Representation Memorandum and a Directors Representation Letter at a special meeting after the closure of SRDC.

Section 3

Spread of research investments across investment areas

Research Project Summaries

Growing the Crop

Milling the Crop

Sustaining the Environment

Skills and Capabilities

Note: as there was no separate category for projects classified in investment areas other than these, some projects were included in skills and capabilities that could have been better classified in an 'other' category.



The University of Queensland's Dr Susanne Schmidt and honours student Stephane Guillou evaluate germinating sugarcane varieties for research on rooting vigour in the presence of different nitrogen application rates.

SPREAD OF RESEARCH INVESTMENTS ACROSS INVESTMENT AREAS

Table 3.0

Composition of National Research Priorities attributed to each SRDC Investment Program (\$'000).

National Research Priorities (NRP)	An Environmentally Sustainable Australia					Promoting and Maintaining Good Health			Frontier Technologies for Building and Transforming Australian Industries					Safeguarding Australia	Total
	A1	A2	A3	A4	A7	B1	B3	B4	C1	C2	C3	C4	C5	D3	
Growing the crop	154	226	251	0	140	201	0	107	125	1044	0	179	514	1322	4262
Milling the crop	0	498	0	0	118	0	0	9	102	233	185	237	34	40	1455
Sustaining the environment	45	144	173	18	85	0	0	158	194	199	47	266	13	12	1353
Skills and capabilities	1	71	39	0	9	0	20	91	0	8	0	22	361	7	629
Total	199	938	463	18	351	201	20	365	421	1484	232	703	922	1381	7699

Key to NRP Goals in which SRDC has R&D investments

An Environmentally Sustainable Australia

- A1: Water – a critical resource
- A2: Transforming existing industries
- A3: Overcoming soil loss, salinity and acidity
- A4: Reducing and capturing emissions in transport and energy generation
- A5: Sustainable use of Australia's biodiversity
- A6: Developing deep earth resources
- A7: Responding to climate change and variability

Promoting and Maintaining Good Health

- B1: A healthy start to life
- B2: Ageing well, aging productively
- B3: Preventive healthcare
- B4: Strengthening Australia's social and economic fabric

Frontier Technologies for Building and Transforming Australian Industries

- C1: Breakthrough science
- C2: Frontier technologies
- C3: Advanced materials
- C4: Smart information use
- C5: Promoting an innovation culture and economy

Safeguarding Australia

- D1: Critical infrastructure
- D2: Understanding our region and the world
- D3: Protecting Australia from invasive diseases and pests
- D4: Protecting Australia from terrorism and crime
- D5: Transformational defence technologies

SPREAD OF RESEARCH INVESTMENTS ACROSS INVESTMENT AREAS

Table 3.1

Composition of Government Rural Research Priorities attributed to each SRDC Investment Program (\$'000)

Rural Research, Development & Extension Priorities	Productivity and Adding Value	Supply Chain and Markets	Natural Resource Management	Climate Variability & Climate Change	Biosecurity	Supporting the Priorities:		Total
						Innovation skills	Technology	
Growing the Crop	1096	0	569	140	1057	494	907	4262
Milling the Crop	1050	9	10	118	20	24	225	1455
Sustaining the Environment	577	0	245	154	20	37	321	1353
Skills and Capabilities	121	0	84	9	0	327	87	629
Total	2844	9	907	421	1097	882	1539	7699

Please note: Data included in this table has been rounded to the closest whole number.

RESEARCH PROJECT SUMMARIES

Thirteen new projects were approved by the SRDC Board in 2012–2013 and commenced from 1 July 2013. No new projects were approved in 2013–2014.

As this annual report covered the time frame between 1 July and 30 September 2013, project summaries were listed for all active projects, including some that were not fully contracted at time of transfer. SRDC managed all active projects between 1 July and 5 August 2013, when SRA was declared the industry services body. Only a very small number of project payments were made by SRDC in this period and these are reported in the financial statements within this report. From 5 August, SRA commenced management of all research projects and milestone payments.

Some projects have been excluded from this report due to their commercial-in-confidence status or because no activity was scheduled in 2013–14. Note that all BSS prefixes on project numbers now signify SRA internal projects.

The deliverables, measures of success and outcomes stated below are those defined in SRDC's five year Research and Development Plan covering the period 2012–2017.

As only the first year of this plan had been completed in 2013, some of these deliverables and outcomes remain aspirational and may be progressed by Sugar Research Australia.

Investment Program	Growing the crop
Investment Category	A1 – Plant Genetics
Deliverables and Measures of Success	<p>Number of technologies, plant varieties, practices, processes and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Limit production losses from weeds, diseases and pests, including incursion threats ■ Increase the genetic potential of sugarcane ■ Improve harvesting systems relevant to the current economic drivers and requirements of the millers, growers and harvester operators.
Outcome	<p>A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, plant varieties, practices, processes and systems by growers, millers and harvester operators. ■ Pest, disease and weed management operations more finely tuned to limit biotic losses. <ul style="list-style-type: none"> – Reduce associated cane production losses by 15 per cent by 2017. – Commercial cultivars achieve 40 per cent of genetic potential. ■ Improved control over the success of the industry breeding program and broadening of the genetic base of the parent population. <ul style="list-style-type: none"> – Achieve greater than 85 per cent of desired parental crosses. ■ Harvesting system that supports the commercial expectations of growers, millers and harvester operators. <ul style="list-style-type: none"> – Reduce field harvester losses by 50 per cent by 2017.

BSS319 – Maximising the rate of parental improvement in the Australian sugarcane breeding program

(Funded July 2008 – March 2016)

Research underway in this project will build on ways to maximise rates of parental improvement and genetic gain in the Australian sugarcane breeding program. This SRA led research project is providing recommendations and tools for breeders to select parents and determine crossing combinations based on phenotypic and molecular information from different selection stages. It will ultimately result in more productive and disease resistant varieties for the Australian sugarcane industry that will be developed more effectively and efficiently.

In 2012–2013 the project planted two clonal assessment trials in two regions to enable better understanding of the genetic control of sugarcane traits and consequently more efficient and effective selection of parents. Ninety crosses were made between the parental clones selected on molecular and/or phenotypic information and parents with high estimated breeding value.

Due to the less than ideal number of crossing combinations made for the selected parental clones, further crosses will be carried out in 2013. These two batches of crosses will be germinated and used to test the effectiveness and efficiency of molecular assisted breeding during 2013–2014. The project will also harvest the two clonal assessment trials planted in 2012–2013.

BSS334 – More crop per drop: Developing water-efficient and drought tolerant sugarcane cultivars for irrigated and dry land farming

(Funded July 2010 – December 2014)

A long-term goal of developing water use-efficient and drought tolerant sugarcane cultivars has been progressed through this and a previous project. The previous project (BSS305) assessed the genetic variation in currently available germplasm and identified elite clones and potential physiological traits for screening water use-efficient and drought tolerant cultivars.

The aim of the current project is to validate the findings made in BSS305 to help move into pre-commercial stage for breeding water use-efficient and drought

tolerant cultivars. The project will test and validate predictions about the value of key water-efficiency and drought tolerance traits identified in BSS305 in different production environments. This project will also conduct extensive trait modelling and detailed field, glasshouse and laboratory studies to understand the mechanistic basis of drought tolerance in sugarcane. This knowledge is expected to develop the screening method to identify elite clones with desired water use efficiency and drought tolerance capacity.

In 2012–2013 the project continued to characterise target clones and target production environments (TPE) identified in BSS305. This helped using Agricultural Production Systems sIMulator (APSIM) crop model for drought trait modelling, but the APSIM sugarcane module was found insufficient to meet the complexity of water stress trait modelling. Hence, to further increase the modelling capacity needed for this project the APSIM module is being refined. In addition, the Canegro™ model will also be used for future water stress trait modelling research in this project.

In 2012–2013 much focus was given to sugarcane physiology research to understand and quantify the yield impact of different water stress tolerance traits under varying levels of stress, soil types and growing conditions. In brief, aspects of stomatal regulation and c-fixation, and intrinsic growth of individual clones appear to be the main drivers of productivity under water deficit condition. Aerial screening of test clones in the field using infrared thermography showed promising results for selecting productive clones under water stress condition. These research leads will be validated in multiple field locations and with genetically diverse populations in the coming years.

In 2013–2014 the project will conduct extensive trait modelling and detailed field, glasshouse and laboratory studies to understand the mechanistic basis of drought tolerance in sugarcane. This knowledge will help develop practical and useful screening methods to identify elite clones with desired water use efficiency and drought tolerance capacity; and validate the technology in breeding programs.

BSS343 – Maximising genetic gain from family and within family selection**(Funded July 2011 – May 2016)**

This SRA led research project aims to investigate changes to current selection methods in an effort to improve the effectiveness and efficiency in early stages of selection. It is expected that these changes will result in increased rates of genetic gain and the release of more productive varieties for the Australian sugarcane industry.

More specifically the project will develop a statistical model to account for competition among families in progeny assessment trials and therefore optimise among-family selection processes. The project will also optimise within-family selection processes by modifying field selection schemes, selecting individuals for their CCS level and smut resistance.

In 2012–2013 the project sampled, harvested and weighed the family trials at the two trial locations. Work has commenced to develop statistical models to account for competition among families and the individual genetic model has been developed using a large amount of historical data. Further work to extend this to the bi-parental model (using pedigree information) is now the focus. These models will be used to analyse the families in this project with and without competition. Preliminary results showed that inoculation of seedlings with smut was effective with significantly increased infection in the plant crop families versus the uninoculated control at both Bundaberg (10.5 per cent vs 4.8 per cent) and Meringa (8.2 per cent vs 0 per cent).

In 2013–2014 the project will conduct extensive trait modelling and detailed field, glasshouse and laboratory studies to understand the mechanistic basis of drought tolerance in sugarcane. This knowledge will help develop practical and useful screening methods to identify elite clones with desired water use efficiency and drought tolerance capacity; and validate the technology in breeding programs.

BSS344 – New germplasm to develop more productive varieties with enhanced resistance to nematodes, *Pachymetra* root rot and smut**(Funded July 2012 – May 2016)**

The genetic base of commercial sugarcane varieties is very narrow, and a large effort in Australia, with Chinese collaboration, over the last nine years has been addressing this problem. This SRA led research project is building on the considerable effort made over the last nine years to develop germplasm from wild relatives of sugarcane, and incorporate this into the core breeding program. The related genus *Erianthus* has been shown to have immunity to *Pachymetra* root rot and contain some useful levels of resistance to nematodes. The intent of the project is to produce breeding parents and/or commercial cultivars with improved traits (cane yield, CCS, fibre, pest and disease resistance).

In 2012–2013, the project made new crosses between the most promising introgression clones and commercial varieties. These new crosses were planted in an experiment to test selection methods for introgression families. The promising introgression clones were propagated for inclusion in final stage assessment trials, and screening of a wider range of introgression families for resistance to the diseases continued. Initial results have confirmed the resistance of *Erianthus* to both *Pachymetra* root rot and nematodes. Hybrid clones between true sugarcane and *Erianthus* appear to be intermediate in resistance compared to the parent clones. The project is also screening progeny from crosses with *Saccharum spontaneum* for resistance to *Pachymetra* root rot, nematodes and smut.

During 2013–2014 the project will plant seedlings from crosses made in 2012–2013 into progeny assessment trials and propagate 10–20 clones for planting into final assessment trials. The project will screen more clones from families that have shown resistance to smut, *Pachymetra* root rot and nematodes.

BSS351 – Improving the accuracy of selection in sugarcane breeding trials through accounting for site variability

(Funded July 2012 – May 2017)

This SRA led research project aims to increase genetic gains through increased accuracy of variety selection. Currently variety selections are made based on phenotypic performance; which is a combination of genetic and environmental factors. To try and restrict variety selections to a more genetic-based approach, this project will provide tools for selecting uniform trial sites and accounting for site variability when uniform sites are not available.

In 2012–2013 the project propagated clones for the two trial sites (Burdekin and Central regions) and began to characterise the two trial sites and prepare them for clonal assessment trials.

During 2013–2014, the project will plant two clonal assessment trials in the Burdekin and Central regions, and develop the statistical model used to account for site variability.

CPI017 – Developing sugarcane for production systems utilising total biomass

(Funded July 2009 – December 2013)

This CSIRO led research project will facilitate the development of cultivars for the Australian sugarcane industry to maximise benefits of fibre and non-sucrose fermentable sugars if they have more value at some time in the future because of technology developments or increased energy prices. Preparation for uncertain future opportunities in sugarcane improvement is important considering the long time (over 10 years) required to develop new varieties. For example, such preparation may include identifying very high yielding clones within existing breeding programs that would normally be discarded because of low or marginal CCS, and maintaining these in case future opportunities arise.

The project is characterising the genetic variation within germplasm available to Australian sugarcane breeding programs for traits including sucrose content, total fermentable sugars, fibre content and composition, and total biomass yields. In 2010, about 200 clones from past introgression breeding programs and commercial breeding programs were selected and propagated, including some which

appeared to have high yields but which would not normally be selected according to current breeding program selection criteria. In 2011, these were planted in trials at four sites – one in the Herbert region and at Plane Creek, and two in the Burdekin.

In 2012, the four trials were successfully harvested and analysed. Overall rankings among all clones were fairly similar ($r > 0.9$) for selection indices assuming positive values for fibre (eg. if realised electricity prices were $> \$120/\text{MW-hr}$) compared with selection indices used in the past for a “sugar sales only” production system. However, some individual clones with higher value than current cultivars assuming fibre has a positive value were identified. These early results suggest that early selection stages of breeding programs may not be highly sensitive to altered selection indices assuming a positive value of fibre, but choosing best individual clones for commercial release may be sensitive to changed indices.

During 2013 the project will assess clones in established trials in the first ratoon crop, complete analysis and interpretation of all results, and deliver a final report which will include recommendations to breeding programs servicing the Australian industry on how best to prepare for future scenarios where sugarcane could be used for energy production in addition to sugar production, and for uncertainty in relation to future relative value of energy and sugar.

CPI024 – Faster flowering – new opportunities for genetic improvement

(Funded July 2012 – August 2015)

This CSIRO led research project will test the physiological and chemical induction of flowering and derive a method for inducing flowering in young plants. The sugarcane plant flowers in response to a complex set of environmental cues and currently sugarcane breeders must use a photoperiod treatment to guarantee flowering in certain varieties. The ability to induce flowering in young plants would significantly reduce the generation to generation cycle time and speed up several aspects of the breeding program. In addition, a better understanding of the flowering process may help identify ways to limit flowering in field-grown crops.

In the first year of the project, the published literature on methods to induce early flowering was reviewed and the photoperiod treatment was successfully

replicated in a growth chamber that has a fully controlled environment. The genes that are likely to control flowering in sugarcane were identified by comparison with published reports on related grasses. The expression patterns of these genes are being tested in plant samples collected during the induction treatment. Diurnal and developmental patterns have been identified, confirming that the selected genes respond to floral induction. In the next steps of the project, a selected gene will be used to develop an assay for early response to floral induction treatments.

In 2013–2014 an indicator gene will be selected and an assay will be designed for detection of an early response to induction of flowering. This assay will be used to test chemical inducers for their activity in inducing early flowering. Further experiments will test the assay as a predictive tool for flowering in field-grown plants.

CPI025 – Development and testing of a SNP marker platform in sugarcane
(Funded April 2013 – August 2015)

This CSIRO led research project is being undertaken in collaboration with BSES and Syngenta and follows on from a pilot study conducted by CSIRO and Syngenta where generation of sequence data from the two parents of an Australian genetic mapping population were used to identify single nucleotide polymorphisms (SNPs) within this population.

This new project will apply a chip based SNP marker detection platform that can accurately screen a much larger number of markers than have previously been deployed in sugarcane, in the hope of identifying markers more closely linked to traits of interest, for example sugar content or cane yield.

During 2012–2013 identification of SNP markers will be carried out on the sequence data generated from 16 sugarcane lines that represent the allelic diversity present in the Australian sugarcane breeding program. This information will be used to generate a genome wide SNP chip for use in sugarcane.

In 2013–2014 sequence data will be generated from key parents and ancestors in the Australian commercial breeding program. A SNP detection platform will be selected based on performance in trials and the sequence data will be used to develop a chip based system that will allow screening of over 80,000 markers across sugarcane genotypes.

ICSB02 – Australian support of the International Consortium for Sugarcane
(Funded January 2011 – May 2014)

This project provides the mechanism for Australian sugarcane biotechnology expertise to engage in a range of wider international sugarcane biotechnology activities under the auspices of the International Consortium of Sugarcane Biotechnology (ICSB). Relatively minor investments in internationally recognised collaborative pre-competitive generic sugarcane biotechnology projects provide Australian researchers with advantages not available to them through any other forum. The project enables Australia to be represented at the international forum, distribute ICSB project reports to Australian groups and to encourage the development of appropriate local project concepts for support by ICSB.

In 2012–2013 the project continued to monitor opportunities for Australian collaboration with international sugarcane biotechnologists and ensure that the results of existing ICSB work is transferred to the appropriate Australian research groups. A final report of #28 “Extent of hom(eo)ologous sequence variation in sugarcane” was received and has been circulated to a number of key researchers in Australia working in the field. A new international collaboration “Pilot project on whole genome profiling to generate a core physical map of sugarcane” to be carried out by staff at CIRAD, France was submitted and funded.

The next meeting of ICSB is to occur in Thailand in early December 2013. Australia has registered and has begun to seek proposals for consideration by the meeting. Several strategic issues have been identified for consideration by ICSB. Two of these in particular require discussion by ICSB partners to help review the role and future of the group.

RESEARCH PROJECT SUMMARIES

Investment Program	Growing the crop
Investment Category	A2 – Pest Control
Deliverables and Measures of Success	<p>Number of technologies, plant varieties, practices, processes and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Limit production losses from weeds, diseases and pests, including incursion threats ■ Increase the genetic potential of sugarcane ■ Improve harvesting systems relevant to the current economic drivers and requirements of the millers, growers and harvester operators.
Outcome	<p>A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, plant varieties, practices, processes and systems by growers, millers and harvest operators. ■ Pest, disease and weed management operations more finely tuned to limit biotic losses. <ul style="list-style-type: none"> – Reduce associated cane production losses by 15 per cent of 2017. – Commercial cultivars achieve 40 per cent of genetic potential. ■ Improved control over success of the industry breeding program and broaden the genetic base of the parent population. <ul style="list-style-type: none"> – Achieve greater than 85 per cent of desired parental crosses. ■ Harvesting system that supports the commercial expectations of growers, millers and harvester operators. <ul style="list-style-type: none"> – Reduce field harvester losses by 50 per cent by 2017.

BSS325 (3) – SmutBuster III: accelerated breeding of smut-resistant varieties
(Funded July 2012 – June 2016)

This SRA led research project is progressing selection of clones from the recently completed SmutBuster II project (BSS325) so that the gains made to date are not lost. So far SmutBuster II has produced five series of seedlings, the most advanced has just been harvested as 1st ratoon cane, the remaining four series range from three-eye sets to plant cane. SmutBuster III is primarily aimed at advancing the five series of seedlings through the full selection process.

In 2012–2013 the project continued with advancing the five series of seedlings through the various stages of propagation and clonal assessment trials. In 2012–2013 the first series of seedlings (2006) were introduced into the core breeding program final assessment trials, with between 50 and 98 SmutBuster clones planted in Burdekin, Central and Southern region trials, along with clones from the core program.

During 2013–2014 the project will continue to advance the five series of seedlings through the various stages of propagation and clonal assessment trials. In 2013–2014 it is envisaged that the second series of seedlings will be ready for introduction into the core breeding program final assessment trials. Comparisons between the performance of clones originating from the SmutBuster and core breeding programs will be made.

BSS331 – Preparing the Australian sugar industry for threats from exotic pests and diseases
(Funded July 2009 – May 2015)

To help protect the industry from exotic pests and diseases, this SRA led research project will develop and validate specific molecular diagnostic tests for known major diseases in Papua New Guinea. Another objective is to develop rapid resistance screening tests for major pests and diseases so that pest and disease resistance ratings can be obtained for the most important Australian commercial varieties. Pest and disease incursion management plans will also be refined as project results dictate.

During 2012–2013 the project collected and analysed the results of the second year (first ratoon) Ramu stunt and downy mildew field-based resistance trials, varietal resistance ratings were calculated from trial data (these will be made accessible through QCANESelect), and *Sesamia* field trials continued. Research into a rapid resistance test for downy mildew was also advanced. A number of current Australian commercial varieties are susceptible to downy mildew. Field trials continued targeting the borer *Sesamia griseocens*. These trials are also obtaining useful information on varietal resistance to two other borers, *Chilo terrenellus* and *Scirpophaga excerptalis*. Patterns of resistance and susceptibility differ for each borer. The molecular diagnostic tests for both Ramu stunt and downy mildew have been validated by field testing and surveys.

During 2013–2014 the project will seek to determine whether rapid shade-house-based techniques for screening for *Sesamia* borer resistance are viable; rapid downy mildew screening methods will also be refined. Improvements will be made to the design of the Ramu stunt resistance screening trials to increase the level of disease in the trials. Transmission experiments will be carried out to further understand relationships between the host, vector and virus. Field-based resistance screening trials for the major diseases (downy mildew / Ramu stunt) and pest (*Sesamia* borer) will continue.

BSS342 – Remote sensing to implement an effective pest management strategy for canegrubs
(Funded July 2011 – March 2015)

Canegrubs remain the most significant insect pests of sugarcane in Australia. Effective insecticides are available but their efficient use requires information on the location of canegrub infestations each year. Remote sensing has been used in other agricultural and forestry systems to detect pest infestations over large areas. This SRA-led project is funded to develop a remote-sensing system that can identify canegrub infestations, develop a web-based system to deliver early-warning information, and facilitate outputs of concurrent projects on risk assessment, cane beetle behaviour and predictive modelling.

Each year, the project will obtain high-resolution satellite images that will be subjected to a combination of analyses to detect canegrub infestations and distinguish them from other

disorders. Web-based infestation maps will be provided to related projects and to collaborating growers and productivity services to obtain feedback, demonstrate the value of the system and encourage its adoption.

In 2012–2013, canegrub damage tentatively identified from satellite images captured early in 2012 was checked from the ground in the Bundaberg-Isis, Mackay and Mulgrave areas; severe crop lodging in the Burdekin precluded damage identification in that area. While many patches of canegrub damage were visible in the images, their identification was confounded with some other crop disorders. Refined analytical techniques may provide better discrimination in the future, although remote detection of these other disorders is also valuable. A further set of images for each of the study areas was captured early in 2013 and checking of damage from the ground has commenced, although this will not be completed until later in 2013. The University of Queensland joined SRA and DAFF Queensland during the 2012–2013 year as a partner in the project to develop algorithms for damage detection using the remote-sensing system.

During 2013–2014 the project will use the refined methodology to correlate satellite imagery with actual locations of cane grub damage in the 2013 calendar year, as well as re-examining images and known damage from 2012. A third cycle of image capture and ground truthing will commence in early 2014. Ultimately, reliability of the refined detection system will be assessed across the three years of image capture and the different districts.

CPI026 – Investigation of smut resistance mechanisms in sugarcane
(Funded July 2012 – August 2015)

This CSIRO led research project will use a combination of molecular techniques and classical pathology to explain the internal and external mechanisms of smut resistance. The aim is to identify markers that can be used to screen sugarcane seedlings at an early stage, in the hope of breeding varieties with multiple mechanisms of resistance.

In 2012–2013 the project advertised the PhD student position. In addition a selection of smut populations was chosen for screening in the field and the protocols for several experiments were developed.

Screening the selected population for internal resistance has verified that a major gene effect is segregating for resistance to smut. An initial RNAseq experiment has been carried out and preliminary analysis of the data has identified a number of interesting genes that showed increased expression in the resistant genotype.

During 2013–2014 the project will carry out QTL analysis on the population screened for internal resistance and identify molecular markers linked to smut resistant genes. Genes that were identified in the RNAseq experiment will also be mapped on to the mapping population to determine if they co-locate to the same regions as identified in the QTL analysis.

GGP056 – A monitoring-based system to enhance canegrub control best management practice for Isis sugarcane growers
(Funded February 2010 – July 2013)

The aim of the Isis Productivity Limited Grower Grub Group was to build the capacity of its members to annually collect relevant information, and to prepare timely, cost-effective and sustainable canegrub database was modified to record grub infestation management strategies. This grower group project worked towards validating systems to monitor grub trends and to use the data in annual grub management planning. The Isis GIS-based and other relevant data for future modelling.

This project was a pilot scheme for the region to gauge if, and in what form, to include grub monitoring in the commercial core business of a local industry service-provider. Group members carried out key processes, with coaching and assistance from skilled persons contracted from BSES, Isis Central Mill, Isis Productivity Limited and Isis Canegrubbers.

More than 95 per cent of growers have embraced the concept of rotation-cropping or legume cover-cropping as part of grub-management, rather than bare-fallow and multiple cultivations as in older recommendations and previous years, especially for control of Childers canegrub. This has occurred largely as a result of growers having acquired the confidence, through demonstration, that modern insecticide treatments are able to stop infestations in new plant crops, and so it is not necessary to bare-fallow and cultivate multiple times to eliminate residual infestations.

Potential outcomes and benefit from this project should be greatly assisted by the remote sensing Project BSS342 “Remote sensing to implement an effective pest management system for canegrubs”. Collaboration and involvement by participants from this project in project BSS342 has potential to greatly enhance outcomes for both Isis and other growers in the region. 83 sites in the Farnsfield region have been evaluated for possible association between grub-damage and unusual symptoms detected through textural processing of remote-sensing imagery from May 2012, using casual labour funds and BSES and Isis Productivity Limited ‘in-kind’ input from GGP056. To date there has been a high proportion of positive associations, all from growers who have not been involved in this grub-monitoring project.

A final report will be submitted to SRA in 2013–2014.

GGP066 – Integrated feral pig management for the Herbert cane area
(Funded June 2012 – January 2015)

This grower group project from the Herbert has brought together growers to focus on managing a feral pig population through collective action and developing a regional specific integrated pest management program. This involves assessing “Hog Gone” (sodium nitrite) and other baits as an alternative or adjunct to 1080 baiting, and investigating feral pig genetics to determine the structure of feral pig populations and whether there are source areas of feral pig populations. An assessment of the attractiveness of sugarcane varieties has also been undertaken.

In 2013–2014, the focus will be on continued genetic collection and testing to understand pig movements and genetic diversity and monitoring of the attractiveness of cane varieties. Grower meetings and presentations will continue as will monitoring of bait options. The group will also analyse DNA material using GIS to create a set of regional data and reference materials.

This project will lead to possible registration of alternative feral pig bait for the Wet Tropics, a better understanding of the impact of cane varieties, adjacent habitats, habitat management and land uses on feral pig population dynamics, and the development of a feral pig integrated pest management program for cane lands in the Wet Tropics.

GGP070 – The Mantis – developing an innovative, high flotation, affordable high rise spray unit (Funded March 2013 – May 2015)

This grower group project will design and develop an innovative and affordable self-propelled spray rig that is able to spray in areas not accessible by current machines. Additional outputs from this project will be improved timing of herbicide applications that will allow a reduction in the use of residual herbicides for long term weed control, cutting residual herbicide rates and increase operator safety due to improved stability.

During 2012–2013 the project engaged an engineer to assess feasibility of concept and to design the concept of the mantis sprayer taking into account operator safety. A concept sketch of the mantis sprayer to enable fabrication was drawn.

In 2013–2014 the project will engineer and source components to build the prototype high rise spray unit.

Investment Program	Growing the Crop
Investment Category	A3 Soil – Plant interactions
Deliverables and Measures of Success	<p>Number of technologies, plant varieties, practices, processes and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Limit production losses from weeds, diseases and pests, including incursion threats ■ Increase the genetic potential of sugarcane ■ Improve harvesting systems relevant to the current economic drivers and requirements of the millers, growers and harvester operators.
Outcome	<p>A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, plant varieties, practices, processes and systems by growers, millers and harvest operators. ■ Pest, disease and weed management operations more finely tuned to limit biotic losses. <ul style="list-style-type: none"> – Reduce associated cane production losses by 15 per cent of 2017. – Commercial cultivars achieve 40 per cent of genetic potential. ■ Improved control over success of the industry breeding program and broaden the genetic base of the parent population. <ul style="list-style-type: none"> – Achieve greater than 85 per cent of desired parental crosses. ■ Harvesting system that supports the commercial expectations of growers, millers and harvester operators. <ul style="list-style-type: none"> – Reduce field harvester losses by 50 per cent by 2017.

CPI028 – Accessing stress resistant sugarcane and research investment from China

(Funded April 2013 – May 2017)

This new four-year research project, led by Dr Phil Jackson from CSIRO Plant Industry, will aid the development of a partnership with breeding programs in China. Yunnan Academy of Agricultural Sciences is proposing a large program in China to develop high yielding and water efficient varieties. Australian breeding programs will obtain access to outputs from this program in return for some technical advice and assistance.

Since April 2013, there have been no significant project milestones to report on this new project. During 2013–2014, the project will finalise a detailed work plan in partnership with research partners in China. It will also begin field and pot trials in China (Yunnan) using basic germplasm clones from the Chinese National sugarcane germplasm collection, and a set of commercial type clones selected from Chinese breeding programs. The pot trial experiments will aim to identify clones with high transpiration use efficiency that may be of value to incorporate into our commercial breeding parent collection in Australia.

The field trials in China will be conducted following similar procedures as followed in the project BSS334, and expected to provide further validation and testing of hypotheses developed in Australia. Results in the project will be progressively used to identify promising clones to import to Australia from China, and develop improved selection methods for selecting clones with higher yields under water limited environments and with higher water use efficiency.

As the project was not contracted before 30 June 2013, this has become an SRA contract.

GGP045 – Developing extended fallow options for the Plane Creek district

(Funded January 2009 – Jul 2013)

This project has been trialling a range of break crop options, in various sequence, in an extended fallow program to identify the most economical and suitable rotation options for canegrowers in the Central Region. The project has partnered with a sweet sorghum project, participated in sugar beet trials, assessed new mungbean varieties, worked with aerobic rice, refined and coordinated soybean and peanut production, chickpeas, corn, sunflower, safflower, and sunhemp. In partnership, the project team is assessing agronomic considerations and viability of these crops.

In 2012–2013, there were setbacks in evaluation of cropping options due to extreme wet weather and poor drainage on the trial site, compromising outcomes on one site. The trial results demonstrated a 19–38 per cent increase in plant cane yield for crops grown on the extended fallow system trialled by the group. Due to a run of horror seasons, and the resulting reduced break crop productivity, the extended fallow options did not prove to be the most profitable in this trial. The group concluded that this trial re-enforces the fact that sugarcane needs to remain the predominate crop on the wet tropical coast, but also highlighted the potential for productivity and profitability gains if more reliable break crop productivity can be achieved.

The final report will be submitted in 2013–2014.

GGP053 – Improvement of internal soil drainage and yield on heavy clay soils in the Herbert***(Funded January 2010 – December 2014)***

This grower group from the Herbert is undertaking this project with the aim of addressing drainage issues in areas of clay soils in the Herbert region. The group is investigating three methods (zonal application of mill ash below the soil surface, GPS positioned mole drainage, and single leg deep ripping below the cane row using zonal tillage), to potentially increase internal soil drainage and cane yields. Information will be extended to other farms within the region with similar problems.

During 2012–2013 the project's required trials were planted, and monitoring equipment was selected and installed. In 2013–2014 the grower group will harvest and collate trial results that will be analysed and disseminated to the Australian sugar industry.

GGP060 – Developing a robust soybean industry in Central and Northern Queensland***(Funded June 2011 – December 2013)***

This grower group project, led by the United Soybean Growers Group and collaborators HCPSL and Farmacist, builds upon the work being conducted by other related SRDC funded projects. This project aims to evaluate new Australian soybean varieties and to import internationally sourced non-genetically modified soybean varieties into Australia from Zambia to develop a robust soybean industry suited to the climatic conditions of Central and Northern Queensland.

Trials have been established in the three regions with varying degrees of success which will further support variety performance results. In 2013–2014 the project will have a focus on early maturing soybean varieties which will address early cane plantings.

GGP068 – Investigating the role of microbes, carbon in soil-plant interaction in Burdekin sugarcane soils***(Funded March 2013 – May 2015)***

There has been a growing interest in the Burdekin sugarcane industry to utilise soil microbes and other ameliorants to improve soil health, increase soil carbon and generally improve soil productivity and enable better utilisation of natural and applied nutrients. The aim of this project is to determine whether by increasing soil microbiological activity there can be agronomic gains through (a) suppression of "bad pathogens"; (b) increasing soil carbon and (c) increasing the availability of "soil pool" nutrients.

In 2013–014, the project participants will establish a pot trial and add value to SRDC funded projects conducted by researchers at the University of Queensland (completed project UQ043 and current scholarship project STU070).

GGP069 – Quantifying the effects of microbial additions to sugarcane soils on crop productivity***(Funded February 2013 – April 2016)***

This grower group project seeks to quantify changes to soil physical (bulk density), chemical (nutrient availability), moisture content (water holding capacity) characteristics as well as parasitic and beneficial nematode populations as a result of soil microbial activity. Trial sites have been established in the Burdekin on burnt and green-cane trash blanket furrow irrigated sites, in Proserpine in controlled traffic plant cane, in Mackay in green-cane trash blanket ratoons, and in the Herbert to investigate soil biology in sugarcane soils under different production systems.

In 2013–2014 the project will establish trial sites in three different regions with a varying degree of treatments. This work will build on SRDC funded projects conducted by researchers at the University of Queensland (completed project UQ043 and current scholarship project STU070).

GGP071 – Strategies to limit the impact of nematode pressure on sugarcane productivity in the Isis
(Funded June 2013 – July 2014)

This grower group project will evaluate sugarcane variety tolerance to plant parasitic nematode populations with an aim to reduce production losses caused by nematode damage in the sugarcane crop following various fallow cropping strategies. The outputs of this project will highlight to growers and land managers the importance of following a nematode management strategy and the need to incorporate this into fallow cropping management strategies.

In 2013–2014 the project will collect trial results that will establish nematode interaction with four cane varieties and yield results between varieties.

GGP072 – Ameliorating clay sub soils to improve crop yields
(Funded February 2013 – January 2015)

This grower group project aims to facilitate an increase in sugarcane yields on duplex soils in the Maryborough cane supply area through the development of a method to ameliorate a sub soil constraint that would result in increasing water availability to the sugarcane crop.

In 2013–2014, the group will design and source components for a subsurface compost/mill mud applicator that will apply ameliorant beneath the soil to a depth of 200–300mm to overcome the crop root constraints of clay sub soils. This project will complement and add value to SRDC funded projects conducted by other grower groups throughout the industry (GGP067, GGP062, GGP061 and GGP059).

NCA012 – UV absorption as a tool for growers to benchmark humified organic carbon in soil
(Funded July 2012 – March 2014)

This project led by the National Centre for Engineering in Agriculture (NCEA) is developing a laboratory-based ultraviolet light (UV) absorbance method for detecting the concentration of humified organic carbon in soil. A simpler field-based method is also being developed, for catchment and crop productivity groups to assess the impact of organic amendments and farming systems in building resilient soil organic carbon.

Since starting the project in November 2012 NCEA has established the ratio of soil to water and the duration of shaking required to extract humified organic carbon from soils of different texture. Soil particle size and salinity do not appear to adversely affect the method. In comparison with standard soil health indices such as cation exchange capacity and wet oxidation organic carbon, the test appears to be more sensitive in detecting differences between soil samples. NCEA researchers have continued to test cane reference soils in consultation with Dr Phil Moody and other industry representatives, to establish the suitability of the testing method for all major cane soil types.

During 2013 the project will establish whether the UV method can be used as an index of key soil health properties such as aggregate stability, mineralisable nitrogen, yield decline, total water holding and nutrient holding capacity. The project team will collaborate with Herbert Cane Productivity Services to test the sensitivity of the method in detecting soil health differences associated with cane yield decline. The toolkit will be tested by members of Advanced Nutrient Solutions grower group from Mackay, comparing the sensitivity of the UV method and the Carbon Farming Initiative Soil Carbon Method in detecting differences in soils previously amended with compost, and unamended soils. Feedback from the Mackay workshop and from collaborating scientists will be used to evaluate the utility of the UV method as a soil health index.

UQ044 – SaveN Cane: Developing selection tools for N-efficient sugarcane
(Funded July 2009 – December 2014)

This continuing project, led by the University of Queensland and SRA, aims to advance knowledge of traits that make sugarcane more nitrogen efficient. Such traits will assist in developing tools for breeding nitrogen use-efficient varieties, thus lowering the demand for fertiliser.

In 2012, the performance of 64 clones – Qcanes, overseas varieties, parental lines and introgression crosses – to 'below-recommended' and 'recommended' fertiliser application was compared for a second season in the 1st ratoon crop (Burdekin) and in a plant crop at a second site (Mackay). Several genotypes with consistently good yield performance at low nitrogen supply across the three crops were identified.

Detailed assessment of biomass and nitrogen accumulation of selected clones with contrasting yield performance with changing nitrogen supply was undertaken over the course of the 2012–2013 season. Experiments in controlled conditions are investigating genotypic differences in leaf traits and photosynthetic responses to nitrogen supply to relate to yield performance.

The project findings to date indicate that genotypes and cultivars respond differently to nitrogen supply. Identified traits include a superior ability to acquire nitrogen from soil and highly efficient allocation of nitrogen to leaves. A subset of contrasting genotypes has been selected for in-depth characterisation in field and controlled conditions to identify key traits contributing to nitrogen use efficiency and their

genetic bases. The results obtained at this point are promising as selecting nitrogen efficiency traits can transform sugarcane production through integration of efficient sugarcane varieties with agronomy advances.

In 2013–2014, the team will identify clones for NUE trait evaluation and continue glasshouse trial assessments. They will also identify traits for further assessment. A stop/go review will be undertaken to assess whether the Mackay site will be maintained and if not, final harvesting of trials will be undertaken.

In April 2013 this project team won the overall SRDC Research Team Innovation Award for Excellence in Research.

Investment Program	Growing the Crop
Investment Category	A4 – Harvesting
Deliverables and Measures of Success	<p>Number of technologies, plant varieties, practices, processes and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Limit production losses from weeds, diseases and pests, including incursion threats ■ Increase the genetic potential of sugarcane ■ Improve harvesting system relevant to the current economic drivers and requirements of the millers, growers and harvester operators.
Outcome	<p>A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, plant varieties, practices, processes and systems by growers, millers and harvest operators. ■ Pest, disease and weed management operations more finely tuned to limit biotic losses. <ul style="list-style-type: none"> – reduce associated cane production losses by 15 per cent of 2017. – commercial cultivars achieve 40 per cent of genetic potential. ■ Improved control over success of the industry breeding program and broaden the genetic base of the parent population. <ul style="list-style-type: none"> – achieve greater than 85 per cent of desired parental crosses. ■ Harvesting system that supports the commercial expectations of growers, millers and harvester operators. <ul style="list-style-type: none"> – reduce field harvester losses by 50 per cent by 2017.

No project investments were undertaken in this area. Plans for a commissioned project to support a series of Harvesting Workshops in 2013 to facilitate industry consideration of current harvester operations and identify R&D priorities required to improve the overall operation of the harvester were approved by the SRDC Board in August 2012 but deferred pending the outcome of the industry restructuring proposal.

RESEARCH PROJECT SUMMARIES

Investment Program	Milling the Crop
Investment Category	B1 – Mill capital use and operating efficiency
Deliverables and Measures of Success	<p>Number of technologies, practices and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Improve processes and materials within sugar mills ■ Support the industry capacity to produce quality sugar to meet market needs ■ Development of market appropriate and optimum performance cane transport systems ■ Maintain an awareness of, and facilitating where possible, value adding opportunities to the current use of the sugarcane plant and its co-products.
Outcome	<p>A profitable milling sector utilising improved technologies and processes through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, practices and/or systems ■ Improved technical and commercial efficiency of the milling operation ■ Raw sugar quality measures supporting market demands ■ Mill transport systems capable of operating at optimum performance ■ Decreasing unit cost of transport and milling operations ■ Greater value derived from sugarcane products.

GGP063 – Investigating renewable feedstocks (such as Hibiscus cannabinus – Kenaf and Crotalaria juncea – Sunn Hemp) for cogeneration at Mackay Sugar Limited

(Funded January 2011 – December 2013)

The Mackay Fibre Producers grower group is investigating the combustion properties of two fibre crops (Kenaf and Sunn Hemp) to assess their suitability as a cogeneration feedstock at the Mackay Sugar Limited sugarcane mill. The project will assess the combustion properties as well as the transport and handling requirements of the fibre crops. The expectation is that these fibre crops may be utilised during parts of the year when sugarcane bagasse is unavailable and coal is used as a supplementary feedstock.

During 2012–2013 the project conducted various trials to find a way to harvest and chop Kenaf at the desired length through a cane harvester including the construction of a new flywheel fitted to a harvester to chop the product at the desired length. A few problems were identified and more trials are needed to find a viable solution. An update on crop production costs was also undertaken which showed some increased costs for the 2012 harvest. The project is due for completion in December 2013 and all results will be reported in the project final report.

QUT014 – Recovery of sucrose Project 2 (Funded July 2010 – July 2013)

One of the current issues facing sugar millers is the inability to reduce the steam consumption of the factory to improve the returns in cogeneration or to produce excess bagasse, which can be used as a feedstock for value adding products. Likewise there are additional value adding components contained in sugar juice solutions that cannot be recovered using conventional sugar recovery processes. This project, led by the Queensland University of Technology, will optimise a new sugar recovery process to extract high purity sugar using a pilot plant rig.

The project has developed a pilot plant to complete some of the key aspects of the work. Trials undertaken identified that sugar solutions could be fractionated with sugar recovered and sugar purity raised above the feed sugar juice solution purity. Further experiments were undertaken to recover sugar from varying types of sugar juice solutions, and assess the financial incentives of the new sugar recovery process.

The project has been delayed to enable a review of the project activities due to difficulties in commissioning of the gas rig which is holding up ongoing research activities. Agreement to a new milestone schedule will be required of all parties.

QUT032 – Developing a new methodology for competency based training courses for shift supervisors in sugar factories

(Funded November 2008 – November 2013)

The Queensland University of Technology led project aims to develop a new training methodology designed to better integrate learning within the workplace using authentic tasks and identified competency standards. The outputs from this project will include supervisors of a higher calibre, and with a higher degree of job and career satisfaction. Factories will benefit from the increased skill level of supervisory staff and through a long term commitment by these key staff to the industry. The course material will also be suitable for operator training.

During 2012–2013 the training modules for extraction, juice clarification and juice evaporation, which are suitable for operators and supervisors, were completed. The Overview module which is specifically for supervisor training was also completed. All modules include assessment materials and activities to enhance the learning experience. To date the SRDC and syndicate members have been provided with the following reports:

- A summary of the outcomes from the initial workshops at 11 mills was communicated in report “Developing a new methodology for competency based training courses for shift supervisors in sugar factories – Program proposal and development plan” dated July 2009.
- As part of Milestone 3 report dated April 2010 a report “Developing a new methodology for competency based training courses for shift supervisors in sugar factories – Milestone 3 progress report” was produced.
- As part of Milestone 4 report dated December 2010 information was provided on a baseline evaluation of the current SRI courses for supervisors.
- Presentations were made at the 2009, 2010, 2011, 2012 and 2013 Regional Research Seminars.

In 2013–2014, the issues of data security and access by mills to web based materials will be resolved, the final modules developed and a final report produced.

QUT038 – Implement supervisory/advisory control of pan and fugal stations

(Funded July 2010 – December 2014)

This Queensland University of Technology-led research project involves the implementation of a smart supervisory/advisory control system (SSCS) for pan and fugal station operations. The project demonstrates and evaluates the system’s effectiveness and acceptability by factory operators, supervisors and management. The SSCS will provide advice to supervisors and operators so that early decisions, such as changes to steam rates or allocation of pans to different duties, result in improved outcomes with respect to avoiding production rate difficulties, and maintaining good operational performance with respect to sugar quality, sugar recovery and minimisation and smoothing of steam consumption on the pan stage.

During 2012–2013 this project developed the transfer systems for obtaining real time cane receipt data and data from the pan and fugal station control systems. Procedures were developed to determine the steam rate requirements for each pan to suit a nominated pan stage cycle time. A fugal model was also developed to predict the sugar production quantity, the molasses production quantity and the purity of the molasses for a nominated massecuite quantity and composition. These models are being incorporated into the SSCS. Touch screens were purchased and are being programmed for the interface between the operators and the SSCS.

During 2013–2014 this project will install and evaluate the prototype SSCS on a factory pan stage. The production staff will be surveyed to assess the performance and acceptability. The outcomes of that feedback will be used to further update the SSCS to better suit the needs of the production staff.

QUT040 – Advanced computer simulation of sugar factories–SysCAD

(Funded July 2010 – November 2013)

This project led by the Queensland University of Technology aims to develop a highly adaptable ‘whole of sugar factory’ process model for ‘whole of plant’ assessments of sugar factories with the option to use either generic models or specific complex models for individual unit operations.

During 2012–2013 this project completed the development of the individual area models in SysCAD for all process stations in the sugar factory. SysCAD models of the steam circuit and water circuit were also completed. The 'whole of sugar factory' model is being developed by linking area models from the different stations. In 2013–2014, the focus of this project will be to validate the 'whole of sugar factory' model using reliable factory data.

QUT046 – Evaluation of mud filtrate clarification options to improve factory performance
(Funded July 2011 – August 2013)

This project led by the Queensland University of Technology built on a previous SRDC project (TSL001), which found that the quality of the mud filtrate could be improved through a simple clarification step.

This project has expanded on this initial finding by identifying the optimum conditions for the clarification of mud filtrate; evaluating and quantifying the improvements to factory operation that can be obtained; and determining the economic feasibility of filtrate clarification for various installation scenarios in Australian factories.

The final report of this project has shown that a mass and flow balance spreadsheet model was developed to investigate the impacts of filtrate clarification and processing on factory operation. It confirmed that filtrate clarification and forward processing the clarified filtrate can improve clarifier capacity by 15–20 per cent. Financial analyses were conducted on the implementation of filtrate clarification for conditions representative of Tully Mill. The financial analyses showed an IRR of 35–40 per cent and NPV of \$350,000–\$400,000 can be achieved if filtrate clarification improves sugar quality by improving molasses exhaustion and mud pol recovery by 0.1 per cent and reduces evaporator scaling enabling an 8 per cent reduction in cleaning costs (1 cleaning stop). Without these benefits the NPV is negative.

On the basis of these findings, the Chief Investigator Professor William Doherty, has recommended that Australian sugar mills should consider filtrate clarification.

QUT048 – Evaluate Brazilian mud filtration technology to increase the profitability and environmental performance of Australian factories
(Funded July 2011 – August 2014)

This Queensland University of Technology led research project is evaluating the performance and operational characteristics of a Brazilian mud filtration system for use in Australian factories. An Australian factory has installed a commercial scale mud filter using this technology.

During 2012–2013, a Technopulp filter unit was installed at Pioneer Mill late in the season. Queensland University of Technology staff assisted the factory in planning the installation and undertook pre-commissioning trials. During these trials, a number of operational problems occurred. One of the main problems was frequent flooding occurring in the press section of the filter due to impervious cakes being formed. Remedial actions were undertaken leading to a significant improvement in performance.

In 2013–2014, further pre-commissioning trials will be undertaken and financial, performance and operational data for the installed system collected. It is planned to conduct a workshop at Pioneer Mill towards the end of the 2013 season for the syndicate members to review the results of the 2013 trials and also to inspect the Technopulp filter in operation.

QUT050 – Improving the performance and specification of evaporator stations
(Funded July 2011 – August 2013)

This research project led by Queensland University of Technology aimed to improve the performance and specification of evaporator stations by investigating changes in heat transfer efficiencies as a result of changed vapour rates to individual vessels and the effects of retrofitted changes to the evaporator stations. The major outputs from this project include recommendations on how to achieve increased juice processing capacity for the evaporators.

During 2012–2013 the project investigated the improvements to heat transfer performance resulting from retrofitting modifications to a final evaporator in a quintuple set. The changes in the juice flow pattern within the evaporator were also determined by measuring the brix of juice at various locations within the vessel.

In addition, data were obtained at several factories where the vapour bleed configuration was changed in order to alter the vapour flow rate distribution with the evaporator set. The logged data are being analysed to determine the magnitude of changes in the heat transfer performance of individual effects.

During 2013–2014 this project will evaluate the improvements in heat transfer performance that were obtained from the retrofit of a modified juice removal system on the final evaporator at a factory. Heat transfer data were obtained at three factories during the 2012 season for operation with changed vapour bleed arrangements. This data will be analysed to evaluate the impact that vapour rate has on the heat transfer coefficient for various operating conditions and a final report will be produced.

QUT054 – Determine the optimum tube dimensions for Robert evaporators through experimental investigations and computational fluid dynamics (CFD) modelling
(Funded July 2012 – September 2016)

This research project led by Queensland University of Technology seeks to determine the optimum tube dimensions for Robert evaporators under a variety of juice processing conditions.

Substantial savings can be made in capital cost, installation cost and floor space in factories if tubes of smaller diameter and greater length can be used while still providing sufficient heat transfer performance. A PhD student is undertaking both experimental investigations and the CFD modelling in this project.

During 2012–2013 the experimental apparatus for the project was designed. The main item was a single tube evaporator that incorporated the flexibility to allow nine different tubes (comprising three different diameters and three lengths) to be tested. The experimental rig was installed into a factory for the 2013 season and a comprehensive evaluation program undertaken to measure the heat transfer performance for the full range of processing conditions normally experienced in factory evaporators. A PhD student, Mr Omkar Theval, commenced work on the project.

During 2013–2014 this project will conduct a comprehensive investigation of the heat transfer performance of a single evaporator tube of different diameters and lengths operating under a wide range of processing conditions. This data will be analysed to provide functional correlations for heat transfer under typical conditions in factory evaporators. These correlations will form an integral part of the CFD model for an evaporator section.

Investment Program	Milling the Crop
Investment Category	B2 Enhancing the value of existing products
Deliverables and Measures of Success	Number of technologies, practices and/or systems at the research, development and extension stage to: <ul style="list-style-type: none"> ■ Improve processes and materials within sugar mills ■ Support the industry capacity to produce quality sugar to meet market needs ■ Development of market appropriate and optimum performance cane transport systems ■ Maintain an awareness of, and facilitating where possible, value adding opportunities to the current use of the sugarcane plant and its co-products.
Outcome	A profitable milling sector utilising improved technologies and processes through: <ul style="list-style-type: none"> ■ Increased adoption of technologies, practices and/or systems ■ Improved technical and commercial efficiency of the milling operation ■ Raw sugar quality measures supporting market demands ■ Mill transport systems capable of operating at optimum performance ■ Decreasing unit cost of transport and milling operations ■ Greater value derived from sugarcane products.

QUT036 – The production of biofuels and value added co-products from thermo-chemical processing of sugarcane bagasse

(Funded July 2009 – September 2014)

This Queensland University of Technology-led research project is developing economically viable technologies for the production of biofuels, platform chemicals and other value added products from bagasse using thermo-chemical processing.

The main outputs are the development of new pre-treatment, hydrothermal liquefaction, fractionation and upgrading processes to manufacture fuels or supply a bio-oil feedstock suitable for processing to hydrocarbon fuels at conventional oil refineries. The project also aims to further develop the production methodology for platform or commodity chemicals, for example levulinic acid and phenolic compounds and their derivatives from the fractionated cellulose and lignin components of bagasse.

During 2012–2013 preliminary trials to fractionate and upgrade bio-oil derived from the liquefaction of bagasse and bagasse derived lignin were completed. Under liquefaction conditions the three main components of bagasse (lignin, hemicellulose and cellulose) each produce a very different range of products. A wide range of products can make upgrading complex and so to maximise the targeted production of oils and chemicals the strategy adopted has been to fractionate the bagasse and optimise process conditions for the separate liquefaction of the bagasse components. Although liquefaction trials have been undertaken on all these biomass components, the focus has been on the upgrading of bio-oil derived from the lignin rich components of bagasse.

The resulting bio-oil has been processed through a newly commissioned solvent extraction pilot plant to recover high value phenolic compounds.

Work planned for 2013–2014 will focus on further refining the solvent extraction pilot plant and extending the combined liquefaction and extraction process to the remaining cellulose rich bagasse fractionation.

This pilot plant will allow litre quantities of the targeted fuels and chemicals from the bio-oil.

QUT049 – Biomass characterisation facility for extended stockpile model accuracy and capability

(Funded July 2011 – March 2014)

This research project led by Queensland University of Technology aims to deliver the experimental means, data and model refinements necessary to advance the capabilities of an existing model to the stage of being a practical stockpile design and management tool for the sugarcane industry. The benefits of the existing model with these proposed enhancements will be an increase in the accuracy of prediction of heating effects in bagasse and other biomass stockpiles and the impact of long term storage on fuel quality.

During 2012–2013 the design, construction and commissioning of equipment to determine mass transfer and heating characteristics of bagasse samples under a wide range of conditions, were completed. Operational procedures were developed for this equipment and bagasse samples underwent tests to determine diffusivity and permeability (characteristics affecting gas flow) of the sample both parallel and at right angles to the direction of compaction of the bagasse. The equipment was used in heating trials to determine the exothermicity of the bagasse at the moisture and compaction conditions of the sample.

The bagasse stockpile model was adapted to enable the exothermicity to be determined indirectly from temperature, gas moisture and flow data collected during the heating trials.

During 2013–2014 this project will use newly developed and commissioned experimental facilities to determine essential flow and heating characteristics for bagasse from a range of regions and storage conditions. These characteristics will be used in the Queensland University of Technology's stockpile model to predict the corresponding heating effects and propensity for spontaneous combustion. Modifications will also be recommended to improve local stockpile design and management. Trials to determine the effects of storage conditions on final fuel quality will also be undertaken and the results incorporated in the existing stockpile model to extend its predictive capability.

QUT051 – Revenue diversification from sugarcane fibre: novel technologies for the processing of bagasse for low-cost biofuels production
(Funded July 2011 – August 2014)

This research project led by the Queensland University of Technology aims to develop and demonstrate novel low cost technologies for the pre-treatment of sugarcane bagasse. Effective pre-treatment of bagasse is required for the conversion of fibre carbohydrates into biofuels or green chemicals via fermentation pathways. Chemical and biofuel products offer significant potential for the sugar industry to diversify and gain new sources of revenue.

During 2012–2013 this project continued to develop, assess and optimise core biofuel pretreatment technologies for the conversion of bagasse to ethanol. During 2013–2014 this project will undertake pilot trials in the Mackay Renewable Biocommodities Pilot Plant to convert bagasse to sugars and ethanol and further develop and optimise core pre-treatment technologies.

QUT056 – Flocculation and sedimentation of slow settling mud and mud cake conditioning
(Funded July 2012 – January 2015)

At times, mills experience periods of poor clarification due to the soil and clay types arriving with the cane supply. This Queensland University of Technology led research project will characterise the soil types responsible for slow settling mud in the mill clarifiers and examine additives which will improve coagulation and flocculation. The project will examine conditioning parameters for mud cake, measuring permeability and assessing methods to best recover residual sugars.

During 2012–2013 a simple laboratory mud former was designed, constructed and tested on mud cake.

Soil samples were collected from sugarcane fields that are known to produce cane that when expressed results in poor juice clarification and slow settling of flocs. These soils were characterised. Two distinct classes of soils were identified; for one class the overall surface charge decreases (ie. tends to zero) with increasing ionic strength, while for the other class the overall surface charge either does not change or increases with increasing ionic strength.

The overall surface charge of soils with good flocculation and sedimentation characteristics was shown to decrease with increasing ionic strength. However, other parameters also influenced the flocculation and sedimentation of particles, and may well override the surface charge and ionic strength relationship.

During 2013–2014 this project will complete the characterisation of soil samples collected from the Burdekin, Innisfail and Mackay regions in order to establish which key physico-chemical properties hinder coagulation and flocculation of particles. From results obtained to date, a number of additives have been identified for evaluation. These will be assessed during the 2013 milling season. A laboratory mud cake former has been constructed and its use to assess various types of mud cake will also be conducted during the 2013 season.

UQ048 – Sugarcane feedstock into fuel additives and chemicals: conversion to Furan derivatives by catalytic processes
(Funded July 2011 – September 2014)

This University of Queensland led research project aims to develop novel materials to be used as catalysts for the production of furan derivatives from sugar waste components. Furan derivatives are one of the most exciting products because they aid in achieving secure energy supply through production of gasoline additives and chemicals from renewable biomass.

During 2012–2013 catalytic testing of novel mesoporous materials selected from batch testing operation using different probe reactions under continuous flow reaction conditions were conducted. Simultaneously, in a separate reactor vessel, runs were conducted for the catalytic hydrolysis reaction to separate cellulose and hemicellulose from sugar cane residues. Preliminary kinetic studies on reactions and determination of activity and selectivity to desired products were studied using water soluble long chain oligomers from cellulose and hemicellulose separated from bagasse pretreatment as feed.

During 2013–2014 this project will continue to develop new catalysts and processes to convert cellulose directly into levulinic acid which can be converted to 2-methyl-tetrahydrofuran which can be used as a gasoline additive with up to 70 per cent blend in current engines.

RESEARCH PROJECT SUMMARIES

Investment Program	Milling the Crop
Investment Category	B3 Transport efficiency
Deliverables and Measures of Success	<p>Number of technologies, practices and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Improve processes and materials within sugar mills ■ Support the industry capacity to produce quality sugar to meet market needs ■ Development of market appropriate and optimum performance cane transport systems ■ Maintain an awareness of, and facilitating where possible, value adding opportunities to the current use of the sugarcane plant and its co-products.
Outcome	<p>A profitable milling sector utilising improved technologies and processes through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, practices and/or systems ■ Improved technical and commercial efficiency of the milling operation ■ Raw sugar quality measures supporting market demands ■ Mill transport systems capable of operating at optimum performance ■ Decreasing unit cost of transport and milling operations ■ Greater value derived from sugarcane products.

QUT033 – Improving the efficiency of traffic office operations through improved traffic officer training (Funded November 2008 – August 2014)

This Queensland University of Technology led research project continues to provide a new structured training package for cane transport staff using innovative methods to efficiently get new staff trained to a defined standard. The project focuses on needs of traffic officers, transport schedulers and planners who manage the safe operation of the railway system and ensure the timely delivery of cane bins to harvesters and the factory, and minimise cane age given system constraints.

During 2013–2014 this project will deliver the final two training modules: ‘Sugar mill business’ and ‘Improving workplace practices’.

QUT047 – Increasing harvest and transport efficiency through the use of locomotive GPS (Funded October 2011 – August 2014)

This Queensland University of Technology led research project will process locomotive GPS data and produce summaries showing average times and the range of times of trips and shunts so that this real data can be used in schedule development and simulation to produce better schedules. The outputs of this project will include increased functionality of the current TOTools software that is used for rail transport scheduling by mills within the Australian Sugarcane industry, increasing efficiencies in harvesting and milling processes.

During 2013–2014 this project will develop real-time applications using locomotive position to estimate siding arrival time for locomotives.

Investment Program	Milling the Crop
Investment Category	B4 – Raw Sugar Quality
Deliverables and Measures of Success	<p>Number of technologies, practices and/or systems at the research, development and extension stage to:</p> <ul style="list-style-type: none"> ■ Improve processes and materials within sugar mills ■ Support the industry capacity to produce quality sugar to meet market needs ■ Development of market appropriate and optimum performance cane transport systems ■ Maintain an awareness of, and facilitating where possible, value adding opportunities to the current use of the sugarcane plant and its co-products.
Outcome	<p>A profitable milling sector utilising improved technologies and processes through:</p> <ul style="list-style-type: none"> ■ Increased adoption of technologies, practices and/or systems ■ Improved technical and commercial efficiency of the milling operation ■ Raw sugar quality measures supporting market demands ■ Mill transport systems capable of operating at optimum performance ■ Decreasing unit cost of transport and milling operations ■ Greater value derived from sugarcane products.

During 2012–2013, SRDC provided funding for a raw sugar quality project (QUT057). This project is still active. As this project is Commercial-in-Confidence, details relating to this project cannot be released.

Investment Program	Environment
Investment Category	C1 – Positioning industry as a leader in environmental responsibility
Deliverables and Measures of Success	<ul style="list-style-type: none"> ■ Develop and implement an environmental stewardship program ■ Investigation of product diversification/waste utilisation opportunities completed ■ A longitudinal study of industry economic, environmental and social footprint.
Outcome	<p>A sugar industry maintaining an awareness of and implementing best practices to ensure the impact of the industry’s operation on neighbouring environments is reduced as indicated by:</p> <ul style="list-style-type: none"> ■ Industry participation in the environmental stewardship programs and increased adoption of associated best practices ■ Government and public acknowledgement of sugar industry’s environmental performance ■ Business development based on utilisation of cane by products ■ Cropping and milling technologies and processes based on more sustainable inputs.

CGH003 – The Herbert Catchment Water Quality Monitoring Project

(Funded July 2011 – June 2014)

Initiated by Herbert River Canegrowers, this research project is led by Terrain Natural Resource Management who have brought a range of industry and government partners together to investigate and identify sources of reef pollutants (such as sediments, nutrients and pesticides) which exist in the region. Partners include representatives from Queensland Government, local Councils, and grazing, mining and conservation industry representatives.

The project aims to develop and implement an integrated monitoring program to inform landholders and extension staff involved in improving land management practices associated with water quality. The results generated will also improve the reliability of the data being used as part of the Great Barrier Reef (GBR) wide integrated monitoring, modelling and reporting program, the 'Paddock to Reef Program'.

During 2012–2013 this project continued to sample both ambient and wet season events to gain a better understanding of reef pollutant loads in the Herbert Catchment and the drivers that affect when and how much of these contaminants make their way into the receiving environment and which ultimately reach the GBR Lagoon. With the delayed onset of the 2012–2013 wet season, timing of nutrient and pesticide applications were delayed due to dry conditions. The contrasting weather pattern from previous years and some of the management actions adopted by growers in response to this generated some startling results in terms of concentrations of some pollutants at particular sites. This data was reviewed within the stakeholder reference group and industry working groups concerned, to develop extension and management strategies to address any environmental concerns.

During 2013–2014 this project will continue to collect, collate and interpret ambient and event water quality monitoring across all sixteen sites in the upper and lower catchment to better reflect the seasonal variation in rainfall and land condition that occurs in the upper and lower Herbert. Data will be provided to the Paddock to Reef Program to better inform the modelling being undertaken as part of this work.

CPI020 – Sugarcane compositional analysis to enable food safety assessment of modified varieties

(Funded July 2010 – July 2013)

This continuing CSIRO-led research project is collecting reference information on the nutritional content of sugarcane stalk from current commercial varieties grown over three seasons across different geographic regions. The data collected will establish the 'normal' ranges within which nutritional components (eg. fat, protein, carbohydrates etc) occur.

Food safety assessment of genetically modified crops and foods carried out by Food Standards Australia and New Zealand, requires an applicant to demonstrate that the nutritional composition of the food is "substantially equivalent" to the same food from an unmodified variety. The assessment will be based on the composition of the sugarcane stalk, since this would be the origin of the food products. The aim of this project is to provide a baseline against which the composition of genetically modified sugarcane can be compared for regulatory purposes.

In 2012–2013 the project analysed the samples from the 2012 season, presented project findings to the project consultative panel and submitted a paper to the 2013 ASSCT Conference. In 2013–2014 the project findings were compiled in a Final Report. The information on the ranges of nutritional components will be published so that it can be used by both regulators and variety developers.

CPI022 – Seed dormancy and establishment: a critical gap in the knowledge to support safe deployment of GM sugarcane

(Funded July 2011 – September 2014)

This CSIRO-led research project is helping to improve our understanding of sugarcane reproduction in commercial fields to assist in the regulation of genetically modified (GM) cultivars. The project will determine whether sugarcane seed exhibits dormancy (and if so what type), identify how long sugarcane seed can remain viable under field conditions, define the abiotic limitations to sugarcane germination and establishment, and design assays that can be used in the assessment of future proposed GM cultivars to determine whether the limits of germination and establishment have been altered.

In 2012–2013 the project performed a number of experiments with freshly collected seed.

The first set of experiments investigated whether sugarcane exhibits dormancy. Fresh seed samples from several fields in far north Queensland were tested and the evidence pointed to a lack of dormancy.

The second set investigated the longevity of seed at multiple sites/environments. These experiments included burial of seed at different depths. The depth of burial has a striking effect on seed longevity. This could be related to a lack of oxygen concentration and decreased water availability at depth. This experiment will be repeated during 2013–2014 to confirm the effect of depth on longevity whilst monitoring important abiotic factors.

The third set of experiments aimed at testing methodologies to determine the abiotic limits to seed germination and seedling establishment and the relative role of competition with weeds. Methodologies for germination at different water status have been tested and experiments are ongoing to develop a model for germination of sugarcane seed driven by temperature and water availability.

To understand the effect of weeds on sugarcane seedling establishment, methods to investigate the soil seed bank and an approach to investigate competition were trialled. The soil seed bank analysis revealed the absence of sugarcane seeds and a high density and diversity of fast growing weeds. The dry autumn and early summer wasn't optimal for the competition experiment with only a few weeds and one sugarcane seedling established. However, the method of eliminating seeds blowing in from outside of the experimental area was successful.

During 2013–2014 the project will conduct experiments which:

1. confirm the apparent lack of dormancy;
2. refine the experimental approaches to testing seed longevity;
3. test establishment of seedlings in the presence and absence of weeds at multiple field sites; and
4. establish biophysical limits to seed germination with respect to temperature and moisture status.

NCA011 – Development of precision spray technologies for the Australian sugarcane industry (Funded July 2010 – August 2013)

This research project led by the National Centre for Engineering in Agriculture has developed new target-oriented precision weed spraying technologies (weeds in crop – Green from Green) and evaluated existing technologies (Green from Brown) to more finely manage herbicide use. In addition, the runoff potential of herbicides applied by precision weed spraying technology was evaluated by rainfall simulator studies.

Key findings from the project which concludes in August 2013 include:

- Runoff concentrations of herbicides are directly proportional to the percent spray coverage.
- The spray footprint of a single nozzle is significantly large; a 30 per cent weed coverage in some instances may lead to 90–100 per cent spray coverage, limiting the opportunity of reduced herbicide use (and associated environmental benefits).
- The performance of the commercial (Weedseeker) system is well understood and was found to be sensitive to background soil conditions and other factors resulting in very good to very poor performance in some instances.
- The development of new technology ie. green from green technology (based on machine vision) was demonstrated with roundup under commercial field conditions and achieved an 85 per cent hit rate with 0.2 per cent overlap of spray coverage on the crop.

QUT027 – Opportunities for the Australian sugar industry in greenhouse gas abatement and carbon trading

(Funded March 2010 – July 2013)

The aim of this project is to maximise the industry's readiness to benefit from the introduction into the economy of greenhouse gas abatement mechanisms. To achieve this the project has:

- defined the carbon life cycle for a range of current and potential industry product mixes;
- provided the industry with a template for life cycle analyses of sugarcane growing, milling, refining and distilling operations for the analysis of individual company operations;
- reviewed current and projected state and federal government policies in relation to opportunities for renewable energy production and carbon trading;
- highlighted the potential carbon trading benefits of integrated sugar milling and renewable energy production and developed recommendations on ways in which the industry can derive maximum benefit from carbon trading.

During 2012–2013 a life cycle assessment (LCA) tool was completed. This tool guides the user through a comprehensive set of input parameters required to define the production processes including material and energy inputs across the full life cycle of cane derived raw sugar, molasses, refined sugar, ethanol and export electricity.

The LCA tool undertakes mass and energy balances to predict product outputs and creates a spreadsheet file which is imported directly into the commercially available SimaPro LCA software to produce the required LCA outputs. Two regional case studies were completed and the results presented initially to the project's Industry Reference Group and later in a paper delivered at the 2013 ASSCT Conference. The project report will be delivered in 2013–2014.

QUT031 – Dunder concentration ***(Funded July 2010 – July 2013)***

This project aimed to reduce the quantity of dunder to be disposed by a distillery through the recovery of soluble solids in the fermentation broth stream. The project utilises a new fractionation technique to recover the soluble solids, producing dried dunder and an effluent stream of low BOD.

In 2012–2013 the project developed and commissioned a pilot plant to complete some of the key aspects of the work. Trials were undertaken with preliminary results indicating very high yield recoveries of soluble solids from dunder using the process, and thus the technique effective in concentrating dunder. It is however evident that some coloured small molecular weight structures associated with melanoidin compounds are resilient to the current operating conditions investigated. These small molecular weight structures remain in the effluent stream and contribute to the BOD of the effluent. In June–July 2013 process operating conditions were modified to target these small molecular weight structures, and the final project milestone report will be submitted in 2013–2014.

QUT055 – Improved modelling of wet scrubbers ***(Funded July 2012 – May 2016)***

This research project led by Queensland University of Technology seeks to identify the most advanced sub-models available for predicting the various flow processes in wet scrubbers, and to incorporate these models into a Computational Fluid Dynamics code. The updated code will be used to improve the design of wet scrubbers to address operational issues that reduce factory crushing rates and increase maintenance costs. Wet scrubbers are an effective means of removing dust from boiler flue gas and are currently used in more than 50 per cent of the industry's boilers.

In 2012–2013 the project advertised and recruited a suitable PhD candidate.

During 2013–2014 the project will carry out a review of modelling techniques applicable to wet scrubbers, determine a preferred modelling approach and construct a test rig. The PhD student funded by this project will visit sugar factories with wet scrubbers to become familiar with wet scrubber operation and the issues that need to be addressed.

UQ045 – Streamlined life cycle assessment (LCA) tool for assessing the environmental benefits of progressive cane growing

(Funded July 2010 – September 2013)

The University of Queensland and BSES Limited developed a tool that calculates the environmental footprint of sugarcane production using environmental life cycle assessment (LCA). The tool, referred to as the “CaneLCA Eco-efficiency Calculator”, makes an otherwise complex LCA process more accessible to the sugar industry by customising it as an Excel-based application with user-friendly interfaces for entering data and interpreting results. It has been designed principally for use by extension advisors to understand the sources of environmental impacts over the life cycle of cane growing, rate the relative performance of a cane growing operation, and compare different combinations of practices. This information can inform practice change decisions and validate environmental improvement efforts.

It is a novel development and one of the first attempts in Australia to tailor an LCA tool for use in an agricultural sector.

The tool was used to compare progressive practices against conventional practices for Wet Tropics, Central and Southern regions, using published descriptions of practice change. It was found that the progressive practices currently being promoted in the industry generally lead to improved environmental efficiency. However other types of practice changes can lead to mixed environmental outcomes, both positive and negative. The analysis demonstrated how the tool can be used to understand the environmental benefits and trade-offs of different practices so that practice change can be optimised to maximise the benefits and minimise trade-offs.

The final report was accepted in early 2013–2014.

Investment Program	Environment
Investment Category	C2 – Waste minimisation and utilisation
Deliverables and Measures of Success	<ul style="list-style-type: none"> ■ Develop and implement an environmental stewardship program ■ Investigation of product diversification/waste utilisation opportunities completed ■ A longitudinal study of industry economic, environmental and social footprint.
Outcome	<p>A sugar industry maintaining an awareness of and implementing best practices to ensure the impact of the industry's operation on neighbouring environments is reduced as indicated by:</p> <ul style="list-style-type: none"> ■ Industry participation in the environmental stewardship programs and increased adoption of associated best practices ■ Government and public acknowledgement of sugar industry's environmental performance ■ Business development based on utilisation of cane by products ■ Cropping and milling technologies and processes based on more sustainable inputs.

BSS352 – Developing measurement tools for nutrients and heavy metals in mill by-products (Funded July 2012 – May 2014)

This SRA led research project aims to use near infrared (NIR) technology to develop rapid, easy to use tools for measurement and monitoring of major nutrient elements within sugar mill by-products, while also conducting traditional wet chemical analyses of heavy metal pollutants in the same samples to provide a baseline picture of by-product composition. NIR based tools will be developed and will be available to milling and farming groups as a product characterisation package for by-product characterisation in the factory with the possibility of extending these methods to field application.

During 2012–2013 the project conducted by-product sampling from a variety of mills and milling regions. There was significant interest and participation from milling stakeholders which suggests a positive future for the subsequent adoption of the technology. A large number of these samples were analysed by wet chemistry and NIR spectroscopic methods, including several samples from each mill and milling area that provided samples. This program of analysis will continue throughout the project as more samples become available. Preliminary calibrations have been successfully developed and validated with true blind samples. Prediction outcomes were positive, with favourable outcomes for carbon, phosphorus and sulphur calibrations. Other calibrations may be improved with the addition of new samples and chemometric data treatment methods.

During 2013–2014 the project will continue the process of developing robust NIR calibrations for major nutrient elements in mill by-products and validate them to an acceptable level of performance. The project aims to prepare and test a commercial-ready NIR to permit on-site measurements of nutrient elements in mill by-products. In addition, the project will develop analytical procedures for heavy metal analysis, test NIR capabilities for heavy metal calibrations and establish baseline information for the heavy metal status of mill by-products.

GGP059 – Developing prescription compost to suit specific soils in Maryborough (Funded February 2010 – December 2013)

The Driving Agricultural Goals grower group in Maryborough has been creating their own compost and has constructed a novel machine that will add the relevant nutrients to the compost that will meet specific paddock needs of cane and soybeans. This project has assisted the group to take the next step and develop methods to tailor the nutrient composition of the compost to soil requirements. This will allow compost to be a complete nutrient source for cane and soybeans.

The group need to understand the effects that various feedstocks (animal manures, bio-solids and saw dust) have on the nutrient composition of their compost and, where needed, to mix-in additional fertiliser nutrients to provide a prescription compost that addresses the particular paddock nutrient requirements.

During 2012–2013 the project harvested trials and results were analysed in terms of their cane and sugar yield, and their CCS. Results showed significant differences and favoured the trials with mill mud application. An economic analysis of producing soil specific compost and soil specific mill mud was also conducted.

In 2013–2014 a value chain analysis will be undertaken and first ratoon data will be included.

GGP061 – Effective use of lower mill mud rates in the nutrition program (Funded April 2011 – May 2014)

The Mount Catherine Cooperative grower group is assessing the effectiveness of banded mill mud (at rates lower than conventional practice) to provide enough phosphorous for the entire crop cycle. The group is also investigating whether the mill mud needs to be incorporated pre-planting to enable sufficient nutrient access, and whether this new application method will result in improved runoff water quality.

In 2012–2013, the project conducted leaf sampling on trials and analysis indicated adequate supply of nutrients in the crops. The teams also conducted a trial information day and held shed meetings where mill mud results were discussed and included in booklets produced.

In 2013–2014 the project will harvest year two trials and collate trial data for dissemination to the Australian sugar industry. This will include production of the final report and presentation of a poster paper to the Australian Society of Sugarcane Technologists Conference in 2014.

GGP067 – Assessing the impact of biochar in the Herbert cane industry

(Funded May 2012 – November 2014)

The Biochar Grower Group based in the Herbert will assess the impact of compost and biochar amendments on low cation exchange capacity soils that are subject to significant potential nitrogen losses and are generally low in general soil nutrition. This project will be the first time a trial has been established to quantify and validate the use of biochar and compost in combination in tropical sugarcane production.

This project has brought together the Grower Group, Herbert Cane Productivity Services Limited (HCP SL), James Cook University (JCU), SITA Organics and Renewable Carbon Resources Australia.

During 2012–2013 the project conducted soil tests and developed a nutrient plan for trials. Trials were then established and biochar and compost were applied as planned. Monitoring activities in the plant cane w started, including germination counts and green house monitoring.

In 2013–2014 the project will harvest its trial site and collate treatment differences.

QUT053 – Process for making bagasse paper pulp
(Funded July 2012 – May 2016)

This Queensland University of Technology-led research project is working closely with EnviroFibre, an industry-based group from Babinda, North Queensland, and Monash University to evaluate and demonstrate an economical small scale process for producing high value market pulp and good quality fertiliser from bagasse. In recent years, the Australian sugar industry has experienced high variability in commodity prices and weather conditions. Diversification of the income stream will assist to protect the industry during periods of low financial returns of sugar products.

In 2012 the project established a Project Steering Committee, and conducted a literature review and a base-case economic assessment of the small scale process.

The literature review and the base-case economic assessment were evaluated against EnviroFibre's business plan. The literature review process identified options to further improve the Internal Rate of Return.

A number of bagasse pulping technologies were conceptualised and evaluated under laboratory conditions to determine optimum pulping processing conditions for bagasse, followed by pilot scale trials. The project aims to create tonnage quantities of pulp which will be evaluated to determine whether the pulp can replace millions of dollars of imported bagasse pulp consumed by Australian paper producers. For the base-case conditions with 15 per cent discount rate, the concept has a positive Net Present Value. The QUT modelling and experimental investigation so far supports the assumptions used in the EnviroFibre business plan which SRDC had independently reviewed prior to funding.

During 2013–2014 the project will continue laboratory based pulping and bleaching experiments and gather preliminary data on the physical and optical properties of the resulting pulp. The project will also investigate the potential for making a fertiliser as a co-product of the pulping process and assess it via a series of pot trials. By the end of 2013–2014 the project hopes to have determined the optimum pulping/bleaching conditions and developed a fertiliser product from the black liquor stream.

SCU003 – Development of value-added products from sugar cane boiler ash
(Funded July 2011 – May 2014)

This research project led by Southern Cross University aims to develop processes for the synthesis of synthetic zeolites and geopolymers from sugar mill bagasse ash. Zeolite minerals are used as catalysts, environmental remediation products, desiccants, detergent builders, molecular sieves and soil additives in supplying plant micronutrients not freely available. Geopolymers are inorganic silica-based-polymers that may be suitable as a concrete or cement replacement. This project aims to convert a factory by-product into an additional profitable product stream.

RESEARCH PROJECT SUMMARIES

The project is investigating the composition of three local sugar mill fly ashes, determining the geochemical composition of the ash during the crushing season and as boiler fuel mix changes. The project will further determine what hydrothermal conditions are optimal for the production of useful zeolites and geopolymer products. Moreover, it will then characterise these materials with a view to defining potential applications and determining economic benefits of production.

In 2012–2013 the project focused on the optimisation of the zeolite formation conditions using a structured factorial design analysis. The results of that work show that several zeolites are formed under different conditions. Desirable zeolites such as zeolite-X and Zeolite-A, are formed and these products are used in low-volume high-value uses, such as detergents. These desirable zeolite systems develop, although their formation is slower than desired.

Several other zeolites and zeolite-like minerals (eg., chabazite, and sodalite) form when temperatures are increased, but also form more rapidly. Zeolite formation from sugar cane bagasse fly ash is limited, and gibbsite (Al(OH)₃), must be added to allow a zeolite to move towards completion.

In 2013–2014, the project will focus more on the geopolymer aspects of the project, and start to develop and test materials for their strength and set properties. In addition, work will commence to remove unburnt carbon from the zeolites because, although desirable zeolites can be produced, they have a darker than desired colour due to unburnt carbon residue. Cleaning out of the unburnt carbon is vital to ensure that the low-volume high value uses can be maintained to maximise profitability of the zeolites produced. A final report is due in 2013–2014.

Investment Program	Environment
Investment Category	C3 – Preparing for a global environment with difference resource availability and values
Deliverables and Measures of Success	<ul style="list-style-type: none"> ■ Develop and implement an environmental stewardship program ■ Investigation of product diversification/waste utilisation opportunities completed ■ A longitudinal study of industry economic, environmental and social footprint.
Outcome	<p>A sugar industry maintaining an awareness of and implementing best practices to ensure the impact of the industry's operation on neighbouring environments is reduced as indicated by:</p> <ul style="list-style-type: none"> ■ Industry participation in the environmental stewardship programs and increased adoption of associated best practices ■ Government and public acknowledgement of sugar industry's environmental performance ■ Business development based on utilisation of cane by products ■ Cropping and milling technologies and processes based on more sustainable inputs.

CPI018 – Climate ready sugarcane: Traits for adaption to high CO₂ levels***(Funded July 2009 – December 2013)***

This project led by CSIRO, has continued earlier research to investigate plant physiological adaptation to climate as a result of inevitably elevated CO₂ conditions. The project aims to contribute to the sugar industry's adaption to climate change by providing strategies that will maximise the benefits of increasing CO₂ levels, ultimately through more effective varieties. The project is reassessing the impact of climate change on the industry by establishing the physiology of sugarcane growing in elevated CO₂. It is also assessing adaptive strategies for the sugarcane plant in terms of improved water use efficiency and photosynthesis and the opportunity for selecting for greater response to elevated CO₂.

The project has established CO₂ response curves for leaf segments for acclimated and non acclimated plants. The results of experiment one were analysed, responses of whole plants to elevated CO₂ were defined and models modified to deal with measured responses to elevated CO₂. In 2012–2013 the project completed two more experiments investigating about twelve clones for responsiveness to elevated CO₂ using a rapid screening method developed from findings of the initial experiment.

In 2013–2014 the research team will complete the final analyses, modelling and recommendations and compile the final report.

CSE022 – A collaborative approach to Precision Agriculture RD&E for the Australian sugar industry
(Funded July 2008 – September 2014)

This CSIRO led research project is coordinating and integrating an evaluation of precision agriculture technologies in collaboration with leading farmers. The project has brought together investigators from three leading research organisations (CSIRO, BSES and National Centre for Engineering in Agriculture) to provide growers with confidence in managing on-farm variability. The project has established experimental sites in Bundaberg, Herbert and Burdekin regions and collated available data.

During 2012–2013, the project put considerable effort into finalisation of a protocol for sugarcane yield map production. However, they identified errors in the

consignment process as a very significant limitation to yield map accuracy, especially when blocks are harvested in more than one harvest event and have recommended accordingly, that if the industry is to move to precision agriculture, it needs to address this issue through development and adoption of some form of electronic consignment system. Work also continued on examination of within block CCS variation.

At the Bundaberg site, CCS variation was estimated to contribute to approximately 23 per cent of the variation in within block income from cane growing. At the Burdekin site, CCS variation appeared linked to variation in yield. However at both sites, the range of CCS variation was narrow and the low resolution of the maps (produced from data collected through hand sampling) limited the team's ability to link CCS variation to other factors. A CCS sensor would promote more robust investigation.

During 2013–2014 the project will place particular emphasis on the temporal stability of patterns of within block variation and on-going yield monitor evaluation. A further area of focus will be an investigation of data fusion of various yield monitoring sensors as an alternative to reliance on a single sensor.

CVA003 – Managing Climate Variability Program
(Funded December 2007 – June 2016)

SRDC has supported improved seasonal forecasting and provision of tools and services to manage climate risk on farm through its investment in the Managing Climate Variability (MCV) Joint Venture. This joint venture (JV) is managed by the Grains Research and Development Corporation on behalf of the JV partners (Grains Research and Development Corporation, Meat and Livestock Australia, Rural Industries Research and Development Corporation, and SRDC, with Cotton Research and Development Corporation also a partner from July 2013).

Investment in improved seasonal forecasts will increase the accuracy of forecasts of variables such as solar radiation, evaporation, wind etc. on time scales from a few days out to climate change time frames. The models can now provide forecasts at seven days that are approaching the accuracy of the three day outlook in the 1980s and this is helping with on-farm decisions such as fertiliser applications. Bureau of Meteorology projects funded by the Managing Climate Variability Program have resulted in the Madden Julian Oscillation

being incorporated into the climate model, POAMA (Predictive Ocean Atmosphere Model for Australia), and routine forecasts and have led to improved skill through a better representation of tropical convection in the models.

Several projects completed in 2012–2013 will provide broad benefits for sugar producers. These include:

- Further development of forecasting skill for regional rainfall and temperature on multi-week timescales, through improved simulation in POAMA and translation of these forecasts into multi-week products on the WATL website, will allow farmers to respond to climate variability through more flexibility in their practices and a tactical response to forecast weather five to 20 days out. Investment by the MCV program has resulted in more rapid development of the POAMA Model which is critical as statistical forecasts which rely on past climate patterns are likely to be less useful in the future as climate changes.
- Development of improved climate products for northern Australia through characterisation of aspects of the monsoon and northern wet season in POAMA with the objective of delivering products such as timing of wet season onset, likely breaks and bursts in monsoonal weather, and basic climate attributes such as predicted rainfall, wind and temperature.
- Evaluation of climate indices and critical temperature thresholds for horticulture crops to examine the impact of climate change and changing seasons and timing of heat and frost events on businesses and cropping systems in specific regions. This project builds on a very successful initial project for selected crops.
- Assessing and managing the impacts of heat stress on cereals.
- Continued support for and growth of communication products and the Climate Champions Program and for feedback from farmers to researchers on forecast and decision support product needs for key decisions for farmers.

From 2013–2016, the program will focus on delivery outputs for the farmer and industry needs identified in a planning workshop held in August 2012. Priority RD&E needs for the next phase of the Managing Climate Variability Program beginning in July 2013 include improved prediction of extreme events

including multiweek timeframes; investigating the use of improved forecasts on multi-week timeframes for nitrogen fertiliser applications to increase efficiency and reduce greenhouse gas (nitrous oxide) emissions; and enhanced mobile access to climate information building on the feedback to the successful launch of the iPhone and web tool, CliMate.

GGP046 – Investigate skip row configuration in sugar cane

(Funded August 2009 – July 2013)

This project led by the Blackburn Harvesting group in Mackay has investigated the feasibility of a skip row cane farming system. The group was interested to determine the gross margin of a skip row controlled traffic system compared to the current system of continuous planting. The skip row configuration that was trialled was a double skip row (a cane row followed by two skipped rows). The project also investigated rotational crop options that would enhance the performance of the skip row system.

During the life of the project several years of extreme wet weather conditions were experienced that influenced trial results. In this time, the skip row was unable to compensate for the wet conditions because of the lack of sunlight and the loss of nutrients, causing poor yield results. In addition, Mackay Sugar had to split cane bin rakes in wet years, resulting in the inability to collect treatment results. The project has generated considerable interest, particularly following early results that showed strong economic benefits from the technique. The Blackburn Harvesting group completed trials in 2012–2013 and analysis of data and a final report is currently being compiled for delivery in 2013–2014.

GGP051 – Maximising centre pivot efficiencies

(Funded April 2009 – December 2013)

The Precise Pivot Management Grower Group is investigating whether centre pivot irrigators can be made more efficient. The group is specifically interested in being able to switch on and off sections of sprinklers to control which paddock segments, traversed by the pivot, are to be irrigated and which are to be left dry. The group is using a computer controller to turn sprinkler valves off in sections of the pivot as it travels over areas not to be irrigated.

The aim is to make the controller user friendly and able to be retrofitted to existing centre pivots.

During 2012–2013 the project team has conducted a cost/benefit analysis of centre pivot (with and without controller) for installation costs, running costs and water use, and held a field day where equipment was inspected and presentations were made to growers.

The results have shown that the use of precision agriculture systems will improve gross margins with a relatively low level of capital investment. Growers will need to determine whether they would be able to make similar labour and electricity savings or expect yield improvement on their farms by comparing data. The risk analysis shows that regardless of price and tonnes of cane harvested in any one year, that the installation of variable rate technology onto crops results in a higher gross margin and reduced labour and electricity costs.

Some follow up trials are continuing in 2013–2014 and a final report will be produced.

GGP065 – Using distribution of organic carbon as a basis for reducing nitrogen application rates (Funded March 2013 – May 2015)

Organic carbon content can vary significantly in sugarcane soils and research has shown soil organic carbon levels anywhere between 0.4 per cent to over 2 per cent. As such, the Homebush Innovative Grower Group from Mackay is interested in trialling equipment imported from the United States of America that is capable of mapping organic carbon distribution in soils. The new grower group project will use this soil organic carbon variability information to then tailor their nitrogen application rates accordingly.

During 2012–2013 the project’s on farm activities were completed at each trial site as per usual farm management practices, trial sites were mapped with the Veris Optic Mapper, organic carbon in the soil was sampled, nitrous oxide measurements have started and gas sampling has followed protocol timings. Analysis of results has been undertaken.

In 2013–2014 the project will harvest and collate the collected data that will provide the basis for ground truthing this concept.

Investment Program	Skills and Capabilities
Investment Category	D1 – Innovation Skills
Deliverables and Measures of Success	<p>Provide events, mentoring training, scholarships, information and industry group support (funds, guidelines and staff) to:</p> <ul style="list-style-type: none"> ■ Increase farm and business managers and advisers’ awareness, capacity and skills to identify improvements and adopt associated technologies and best practices ■ Fill identified RD&E skills gaps in the industry ■ Support people in leadership positions to enhance their capacity to drive the industry forward ■ Develop and support effective relations across the value chain to drive the industry forward.
Outcome	<p>People within the sugar industry committed to a culture of education, learning and innovativeness and creating a sustainable sugar industry through:</p> <ul style="list-style-type: none"> ■ Increased innovation and adoption of viable technologies and best practices by farm and business managers and advisers ■ Stronger value chain relations increasing resource use efficiency and maximising revenue ■ Improved industry leadership through greater participation, skills and capacity ■ RD&E capabilities available to fulfill future needs of the industry.

BSS353 – Improving capacity in the Australian sugarcane breeding program in analysing and using DNA marker information

(Funded October 2012 – September 2013)

This Capacity Building Project provided assistance for Dr. Jose Luis Crossa, an expert in developing statistical models and methods in plant breeding to visit QLD for one week to meet with the BSS319 project team and to conduct a multi-institutional workshop. Dr. Crossa's program of work was to:

- evaluate current analysis procedures on marker data being used;
- introduce new methods in analysing large sets of DNA marker data and associated traits to Australian sugarcane geneticists, breeders and biometricians. Better use of these data will improve the prospects of application of DNA markers to sugarcane breeding programs;
- deliver a multi-institutional workshop to sugarcane research staff;
- visit BSES sugarcane experiment stations; and provide guidance considering latest developments in genetics and particularly animal breeding.

During 2012–2013 the project received acceptance of the invitation forwarded to Dr. Crossa. The travel itinerary for Dr. Crossa and the schedule of project activities were finalised and the visit was undertaken.

In 2013–2014 a summary of outcomes of the visit will be detailed in the final project report.

BSS354 – Assessment of the current state of phytoplasma sugarcane diseases in South-East Asia ***(Funded January 2013 – January 2014)***

This Capacity Building Project provided funding for travel for Dr Rob Magarey of SRA to visit Thailand, Laos and Vietnam to gain a better understanding of the diseases caused by phytoplasmas in South – East Asia (white leaf, grassy shoot and green grassy shoot). These pose a significant biosecurity challenge to the Australian sugar industry. Dr Magarey will also attend the International Society of Plant Pathology Conference in Beijing (Dr Magarey is the Australasian councillor to this Society) in August 2013. The focus of the field visits will be to gain a better understanding of disease transmission, resistance screening methods and the possibility for collaborative research.

During 2013–2014, the visit to Thailand, Laos and Vietnam will be made and a report written summarising important information about the diseases in these countries. Recommendations will be made on the most urgent research required to reinforce the security of the Australian sugarcane industry. Attendance at the International Society of Plant Pathology Conference will provide a valuable update on world plant pathology technology, renew contacts with other pathologists and enable Dr Magarey to provide feedback from Australasia on plant pathology in the region.

BSS355 – Enhancing sugar mill operating efficiency using integrated laboratory NIR instruments and networked systems

(Funded January 2013 – December 2013)

The Capacity Building Project provided funds to send Dr David Donald to the NIR-2013 Conference and associated workshops in Montpellier, France, in June 2013. The Conference and Advanced Chemometrics Workshops provide significant opportunities to:

- Present current NIR laboratory management techniques used within Australian sugar mills, refineries and research organisations.
- Develop improved NIR laboratory management practices to facilitate the growing trend of using NIR techniques to replace a large percentage of traditional laboratory assays.
- Update information regarding new sampling presentation and laboratory practices aimed at improving the scope of NIR laboratory measurements.
- Enhance NIR calibration and data management methods which will further add value to the large industry NIR database and drive future benefits to milling and grower groups.

During 2013–2014 Dr Donald will produce publications and present to the ASSCT and ISSCT Conferences in 2014 as well as publish an article in the BSES Bulletin reviewing existing laboratory NIR methods and potential future developments within the sugarcane industry, both domestically and internationally.

CPI027 – Participation in the International Symposium on New Paradigms in Sugarcane Research

(Funded August 2012 – July 2013)

The Sugarcane Breeding Institute (SBI), an institute within the Indian Council for Agricultural Research (ICAR) is one of the most famous and significant sugarcane breeding programs in the world. Coinciding with the centenary of SBI's existence and development of the first interspecific hybrid clone (Co205), an International Symposium was organised by SBI during October, 15–18, 2012 titled "New Paradigms in Sugarcane Research".

The objectives of this Capacity Building Project were:

- To facilitate participation by Australian sugarcane scientists (Phillip Jackson, Karen Aitken, Graham Bonnett) at this Symposium.
- Through the above symposium gain new knowledge of a range of current global developments in sugarcane genetic improvement.
- To review current status of sugarcane genetics and breeding in India – this would not be apparent from reading the restricted literature available.
- To develop connections with researchers and breeders around the world and particularly in India, and identify potential collaboration opportunities, particularly relating to germplasm exchange.

The project achieved the objectives and a report was delivered in early 2013–2014. The Symposium covered a wide range of themes, with most concerned with genetic improvement of sugarcane. The Symposium provided an opportunity to review a range of sugarcane research around the world and particularly in India. About 55 delegates from outside India attended, and there were over 500 delegates from within India. Each of the Australian scientists being funded in this project made presentations at the Symposium, which helped facilitate introduction to other attendees.

Separately, a meeting with the Director of SBI and several senior SBI scientists, and CSIRO staff was held near the end of the visit to discuss possible areas of collaboration. Areas of strong interest at this stage were in (i) improving sucrose content, (ii) improving response to water stress, and (iii) understanding and addressing red rot resistance. Overall, from observations and discussions with SBI staff,

there would seem to be clear opportunities and willingness to develop mutually beneficial research and breeding projects. Follow up activity is now required to capitalise on the initial visit and discussions.

CPI031 – Strategies for water efficient sugarcane; a CSIRO-EMBRAPA workshop to share knowledge and develop collaborations

(Funded May 2013 – September 2013)

The objective of this Capacity Building Project was to bring together the expertise from CSIRO and Embrapa (the Brazilian Corporation for Agricultural Research) to share knowledge and to develop joint approaches to sugarcane research. Following a high-level meeting between the two organisations in April 2012, common interests were identified in developing water-use efficient sugarcane varieties to improve industry sustainability and to allow expansion of cropping areas into non-irrigated land.

Four CSIRO researchers (Dr Mark Peoples, Dr Anne Rae, Dr Phillip Jackson and Dr Graham Bonnett) participated in a workshop held from 19–21 June 2013 at Embrapa Estudos e Capacitação – CECAT in Brasília, Brazil.

The presentations encompassed major themes related to WUE including: (i) climate change effects on future water supply, (ii) water resources, (iii) irrigation systems, (iv) genetics, genomics and biotechnology applied to the development of more efficient crops, (v) the effects of farm management, and (vi) phenotyping for drought tolerance traits. Following the presentations, working groups identified priority research topics for further development: (i) crop models for tropical environments, (ii) genome-wide selection systems, (iii) metabolomics as a tool for characterisation, and (iv) science to enable regulation of GM varieties. Both organisations are now actively pursuing resources and mechanisms to enable the exchange of scientists and students, and to develop specific joint research proposals.

The researchers also visited the Embrapa Cerrados Research Centre, (Centro de Pesquisa Agropecuaria dos Cerrado), Planaltina, Distrito Federal to view the facilities used to screen sugarcane varieties for drought tolerance.

The project report was delivered in early 2013–2014.

DPI024 – Irrigation Bus Tour – Extension of MAF002 (Funded March 2013 – September 2013)

This Capacity Building Project, an initiative of the Burdekin Cane Extension Group, funded twenty growers from the Burdekin to the wet tropics and Atherton Tableland area to explore different irrigation practices and to identify ways of overcoming management issues experienced with furrow irrigation and the introduction of green cane trash blanketing systems in the Burdekin.

Irrigation, despite its importance in the production system, hasn't been a primary focus for targeted extension activities with growers in the Burdekin in recent times. This project (in conjunction with irrigation scheduling workshops and MAF002) aimed to give growers a better understanding of irrigation management by increasing awareness of crop and soil water use characteristics and loss pathways. Special consideration was given to dealing with issues such as farming system and soil type constraints that lead to irrigation inefficiencies. The tour included on-farm visits to both furrow and overhead irrigation systems which were investigated under the previous SRDC project MAF002. The group also learnt how to maintain irrigation efficiency when adopting farming systems changes such as green cane trash blanketing and fallow crops. The trip included farm visits in the Wet Tropics with demonstrations of newly developed dual herbicide application technology and other associated improved farming systems such as use of minimum tillage. The general intent was that this opportunity would encourage innovative thinking and create networks between growers in different regions.

While it aimed to focus on regional Burdekin issues in relation to irrigation and water quality, it also created a valuable network and ability to share experiences with growers and industry in the only other fully irrigated region. The project also drew from another completed SRDC project (MAF002) to build on the knowledge already gained from alternative irrigation systems, and showed why they are used heavily in the Tablelands. The project report will be delivered in 2013–2014.

NFS003 – Advancing Australian sugarcane farming systems

(Funded March 2013 – July 2013)

This Capacity Building Project saw six members of the NSW Farming Systems Group travel to the USA to gain first-hand experience with reduced tillage systems and machinery in the US grain belt. The group was particularly interested in investigating innovative tillage equipment capable of direct drilling sugarcane into heavy clay soils in raised bed farming systems and eliminating the need for intensive cultivation practices between soybean harvest and cane planting.

A number of companies were visited throughout the Mid-West explaining an assortment of tooling concepts that are leading edge componentry, especially for strip tillage farming practices. These unique practices are recognised as the new standard for conservation tillage in the United States mid-west grain belt. Members of the NSWFSG that travelled the Mid-West identified manufacturing companies we believe to have their own unique approach to strip tillage, and the success of the project will be a combination of some of these concepts. Previous attempts to gain the necessary knowledge and implementation procedures have proven to be insufficient through correspondence alone.

The NSWFSG has been successful with \$15k funding for NSW CMA to build a strip tillage machine based on this U.S. research trip. Observations on the most effective componentry have been used by the NSWFSG to develop a prototype minimum-tillage machine for heavy clay soils. This prototype will be used to establish demonstration sites and be available for grower loan. The group has already begun to promote outcomes from this research through the Australian Sugar Industry. The project report was delivered in early 2013–2014.

QUT041 – Enhancing and broadening knowledge of evaporation processes through attendance at the ISSCT congress 2013

(Funded March 2013 – December 2013)

This Capacity Building Project supported attendance of QUT PhD student Omkar Thaval at the June 2013 ISSCT Conference in Brazil. It also allowed him to take advantage of the Conference to also seek out and better understand the operation of evaporator technology installed in a range of Brazilian sugar mills. The Brazilian mills of interest have Robert type vessels, rising film plate heat exchangers, Kestner vessels and Semi-Kestner vessels. Australian mills generally only have the Robert type vessels installed. Mr Thaval has just completed a Masters (Research) degree at Queensland University of Technology and is commencing a PhD on evaporator design.

QUT044 – Sugar Technology Innovation (STI) Scholarships

(Funded June 2010 – September 2013)

SRDC co-funded a range of scholarships with Sugar Research Limited to enhance capacity building in the milling sector and to enable students to conduct research projects to improve the economic and environmental sustainability of reducing production costs and improve the utilisation of capital and other resources for sugarcane milling, sugar refining, sugar and sugarcane handling, and technologies adjunct to sugarcane processing. During this period research activities involved four projects. SRDC only provided one year of funding for these STI projects.

- **Improved separation technology for sugar cane biomass recovery and increased renewable energy production by PhD student Christopher Henderson**
A test facility to evaluate a number of mechanical cane separation concepts and validate model outputs was designed, fabricated and commissioned at QUT's Banyo Pilot Plant Precinct. Experimental trials were run using this facility to separate a range of particle types representative of cane stalk and leaf. The test facility has demonstrated the successful mechanical separation of cane 'leaf' and 'billet' particles and identified the impact of key operational parameters on separation performance.

- **Modelling the flow of cane constituents through the milling process of a raw sugar factory by MSc university student Omkar Thaval**

This project has been completed and an MSc thesis was submitted in February 2013. The basic concept behind the project was based on the premise that the various processes downstream of the milling process involve cane constituents that are not commonly considered in the milling process such as the clarification process where mud solids are present. The project aimed to track these other cane constituents through the milling process, making sure that they end up in either bagasse or mixed juice as required for the downstream process models. Various models were developed including an enhanced milling extraction model in which new factors including true fibre separation efficiency, separation efficiency of insoluble solids and true fibre factor were defined. The full milling model was then implemented in SysCAD, a processing modelling package currently being developed at QUT as the software platform for a whole-of-sugar factory model.

- **Studies on the clarification of juice from whole sugar cane crop by PhD student Caroline Thai**

This study examined the composition and colloidal chemistry of particles present in different types of juices, and the impact trash impurities have on the coagulation and flocculation processes. This is to provide insights as to why it is difficult to process juice expressed from whole crop. As a result, strategies for cost-effective clarification of juice expressed from whole crop have been identified. The project has been completed.

- **Colour removal from sugar cane juice by PhD student Danny Nguyen**

One of the most important parameters in raw sugar quality is colour. A new approach that has the potential to efficiently and cost-effectively decolourise sugar process streams has been evaluated. Although there was a slight increase in colour at pH 7 in factory juices, there was significant colour reduction at pH 9. Colour measured at pH 9 is due to the presence of natural colourants such as flavonoids and phenolics. The colour at pH 9 is more likely to be transferred to the crystal, so there may well be colour reduction if treated juice is further processed to raw sugar. The project has been completed.

STU065 – Milovan Bokan – Abiotic stress tolerant sugarcane: Drought-proofing sugarcane with cell-death protection genes

(Funded February 2008 – August 2013)

The objective of this PhD project was to use a single gene approach to engineering osmotic stress tolerance in sugarcane using a transgenic approach. In 2011–2012 molecular analysis was done to confirm transgene integration/expression in selected transgenic plants of Q117 variety. The transgenic plants were exposed to drought conditions in the glasshouse, various physiological parameters were studied and comparisons were made with the non-transgenic control plants to identify the transgene that can confer osmotic stress tolerance in sugarcane. Transgene psy3 was found to confer significant drought tolerance to Q117, as compared to the wild type controls.

STU065 – Karen Benn – The motivators and barriers to the adoption of more sustainable farming practices

(Funded Sep 2005 – August 2013)

The objective of this PhD project was to ascertain the factors that motivate people in the sugar industry, in the Wet Tropics region, to adopt more environmentally, socially and commercially sustainable farming practices and accept industry changes. The project assessed what people in the sugar industry, in the Wet Tropics region, perceive to be the barriers to the adoption of more environmentally, socially and commercially sustainable farming practices. The study recommended options for overcoming the barriers and improving the uptake of more environmentally, socially and commercially sustainable farming practices. In 2013–14, Karen Benn completed her study and was awarded her PhD.

RDC001 – Horizon undergraduate research scholarship

(Funded February 2013 – February 2015)

The Horizon Scholarship Program is jointly funded by the Rural Research and Development Corporations and is coordinated by the Rural Industries Research and Development Corporation (RIRDC). The Scholarship is designed to promote the dynamic and diverse career pathways that agriculture can offer students entering tertiary education, while helping to address the chronic shortage of trained professionals

entering primary industries. In 2012–2013, SRDC sponsored a scholarship for Matthew Rogan to assist his studies in undertaking a Bachelor of Agricultural Science at the University of Queensland. The scholarship supports the students throughout the course of their undergraduate studies by providing them with a financial bursary and professional support in the form of mentoring, professional development workshops and industry placements.

SRD035 – Nuffield Foundation Scholarship and support

(Funded July 2011 – September 2015)

In early 2013, applications opened for the third SRDC funded Nuffield scholarship. A selection panel involving members from the Nuffield Board and past scholars assessed shortlisted applicants in June–July 2013. The winner of the SRDC funded Nuffield scholarship was Marian cane grower Simon Mattsson. Simon received his scholarship during the Nuffield Spring Conference in Perth on 18 September 2013 and his project is due to be completed in September 2015. SRDC has funded three Nuffield scholarships each taking 2 years to complete. SRDC Nuffield Scholarship winners are: Bryan Granshaw from Dalbeg North Queensland 2011–2013, Joe Muscat from Mackay 2012–2014 and Simon Mattsson from Marian 2013–2015.

SRD051 Grower Group Innovation Project Program (GGIP) Review

(Funded May 2013 – August 2013)

SRDC commissioned a review of its investment in the GGIP program. The GGIP review aimed to determine the impacts (benefits) of the GGIP using Council of Rural RDCs Benefit Cost Analysis guidelines in terms of economic, social and environmental benefits to the sugar industry and communities (based on evaluating the inputs, outputs and outcomes of current and completed GGIPs) and identifying successful outcomes from GGIPs. The review also provided recommendations for future investment and management of GGIP and grower-led research.

SRD053 – SRDC Scholarship Program Review
(Funded May 2013 – August 2013)

SRDC commissioned a review of its investment in the Scholarship Program. Through this review, SRDC sought to gain a better understanding of the value and outputs generated by the investment in the Scholarship Program and identify improvements to maximise its investment in this program. The review developed recommendations for future investment in scholarships.

STU066 – Darryn Rackemann – Production of levulinic acid and its derivatives from sugarcane biomass

(Funded July 2009 – January 2014)

This PhD project at the Queensland University of Technology is investigating how to optimise and integrate the thermo-chemical production and recovery of levulinic acid and its derivatives from sugarcane bagasse in sugar factories. Initial results have shown that strong biodegradable sulfonic acids are able to produce similar chemical yields to conventional technology without the drawbacks of using corrosive mineral acids.

During 2012–2013 the project progressed satisfactorily. Work undertaken to optimise product yields from both treated and untreated bagasse has produced excellent data. Furfural has been produced in high yields (~90 per cent) far exceeding yields (70–80 per cent) reported in literature from acidic aqueous mild temperature processes. This was achieved through systematic evaluation of the role cellulose reactivity, delignification and xylan content had on yield. Glycols were shown to reduce side reactions and produce both acids and esters that allowed overall product carbon yield to be improved by up to ~20 per cent. As high yields could be achieved under relatively mild conditions, the process could readily be integrated with the existing infrastructure and utilities of sugar factories. This would allow sugar factories to be converted into biorefineries permitting greater utilisation of the sugarcane resource. In 2013–2014 the project will conclude with the submission of a PhD thesis.

STU067 – Kameron Dunn – Conversion of lignin to industrial fuels and chemicals

(Funded July 2009 – January 2014)

This PhD project at the Queensland University of Technology aims to develop a sustainable economically viable process for the conversion of sugar cane lignin via hydrolysis into oils, and the fractionation of these oils into various compounds for industrial applications. The targeted products are biofuel and higher value platform chemicals such as phenolics. To date this project has identified the influence of pre-treatment techniques on the recovered lignin structure and on the subsequent oil yields recovered from the hydrolysis of sugar cane lignin. Likewise the choice of catalysts and concentrations, and reaction times has been assessed. Optimum conditions have been determined for targeted chemical compounds and chemical structures.

During 2012 the project investigated the chemical structure and composition of the lignin residue following the hydrolysis reaction, and identified the reaction conditions that minimised this residue. In 2013 the project will focus on the fractionation and recovery of products from the oil fraction derived from lignin hydrolysis. A thesis will be submitted later in the year providing details of the findings of the project.

STU068 – Patrick Bewg – Modification of lignin biosynthesis in sugarcane for the improved production of cellulosic ethanol

(Funded February 2010 – July 2014)

This PhD project at the Queensland University of Technology involves transforming sugarcane with either maize or sugarcane gene sequences known to down-regulate lignin biosynthesis. This will allow for an increase in the cost-efficiency of bioethanol production from the sugarcane bagasse without negatively impacting growth and sugar production. Concurrently, a developmental profile of lignin biosynthesis and deposition in sugarcane as it matures is also underway.

During 2012–2013 the developmental profile has completed the quantification of lignin biosynthesis gene expression levels and cell wall components in stem sections of different ages, allowing for their comparison. The sugarcane transformed with maize genes have been analysed and results show that the

expression of these genes has reduced the expression levels of lignin biosynthesis genes, which in turn has significantly reduced the lignin content when compared with controls. The sugarcane transformed with the sugarcane gene sequences have also been analysed and the results suggest that these gene sequences may also exhibit lignin altering properties.

During 2013–14 the PhD is expected to conclude with the submission of a thesis. The final laboratory experiments are currently underway which includes an in-depth analysis of the lignin polymer of the transgenic sugarcane and confirming via enzymatic hydrolysis that the alterations made to the lignin in the transgenic plants improves the yield of fermentable sugars usable for second generation bioethanol production. It is anticipated that three academic papers will be published during 2013–2014.

STU070 – Richard Brackin – Microbiology of sugarcane soils

(Funded January 2010 – December 2013)

This PhD project will continue to further gain knowledge and understanding about how management strategies can be used to promote healthy soil through soil biology, while assessing the potential of a variety of ‘new’ soil additives in terms of their effect upon soil biology and soil health. These results will aid in developing new “best practice” management guidelines. During 2012–2013 the project has examined the effects of soil compaction on soil biology and greenhouse gas emissions. During 2013–2014 the project will use novel microdialysis techniques to examine the rates of nitrogen fluxes through various forms in soil immediately after fertiliser application. In 2013–2014 the project will conclude with the submission of a PhD thesis.

STU071 – William Gilfillan – Biodegradable polymer nanocomposites derived from natural fibre and starch

(Funded January 2011 – July 2014)

This PhD project at the Queensland University of Technology aims to develop starch based biodegradable composites by blending nanofibres derived from sugar cane bagasse and starch. Work so far has shown that the addition of bagasse fibre to starch reduced moisture uptake and increased the mechanical properties of the films.

During 2012–2013 the project examined the use of nanofibres and reactive extrusion to improve the properties of starch films. The tensile strength and Young’s Modulus increased up to 200 per cent and 300 per cent respectively with the addition of nanofibres compared to microfibrils. This is because bagasse nanofibres have a much larger surface to volume area and aspect ratio (ie., length/diameter), and have a reduced lignin and hemicellulose contents. Surprisingly, reactive extrusion in the presence of alcohol (without any additive or starch modification) improved starch film stiffness as the alcohol acted as an effective cross-linking agent. The project will conclude in 2013–2014 with the submission of a PhD thesis.

STU072 – Anthony Brinin – Enhancing sugarcane for decreased water content and increased sugar content at harvest

(Funded January 2011 – July 2014)

This Queensland University of Technology PhD project aims to genetically enhance sugarcane to have a reduced water content and increased sugar content at harvest. Sugarcane that has lower water content at harvest would substantially reduce the costs associated with processing and transport of the harvested crop. Increasing the sugar content of sugarcane would also directly add substantial economic value to sugarcane.

During 2012–2013, with assistance from the results from this project, a provisional patent has been filed. The provisional patent is based on the technology of using an inducible gene switch to control a gene that regulates stomatal function thereby allowing control of water loss from plants.

During 2013–2014 the focus of this project will be characterising the effect of inducibly expressing a gene that regulates stomatal function in *N. benthamiana* and sugar cane. The aim of this research is to inducibly drought stress these plants and then assess the effect of this inducible drought stress on the sugar and water content of the drought stressed plants. The project will conclude in 2013–2014 with the submission of a PhD thesis.

STU073 – Danielle Skocaj – Climate forecasting to improve sugarcane nitrogen management in the wet tropics

(Funded January 2011 – July 2014)

This James Cook University / BSES Limited PhD project aims to validate nitrogen (N) fertiliser requirements for ratoon crops of sugarcane grown in the Wet Tropics region, determine the ability of crop models to predict sugarcane yield responses to different N fertiliser application rates for different climatic scenarios, and investigate the impact of natural climate variability on sugarcane N fertiliser requirements in the Wet Tropics region. During 2012–2013:

- The literature review, “*Nitrogen management guidelines for sugarcane production in Australia – Can these be modified for wet tropical conditions using seasonal climate forecasting?*” was accepted for publication in Springer Science Reviews subject to minor revisions.
- Familiarity with the APSIM sugarcane crop growth model was gained by modelling data collected from a previous N rate field trial. This preliminary investigation into the impact of natural climate variability on sugarcane N requirements in the Wet Tropics was conducted by determining the optimal N rate for each year of the field trial. This was then compared to the current best management practice rate determined according to the Six Easy Steps N management guidelines. This resulted in the production and acceptance of an ASSCT paper, “*Modelling sugarcane yield response to applied nitrogen fertiliser in a wet tropical environment*” in the 2013 proceedings. This experience is considered essential for investigating the impact of natural climate variability on sugarcane N requirements in the wet tropics.
- Key concepts of the research project were presented to the international audience who attended the 2012 ISSCT Agronomy and Agricultural Engineering Workshop in Townsville. This enabled knowledge exchange between Ms Skocaj and participants of various research and extension specialities from a wide range of sugarcane-growing regions, and created a valuable networking opportunity.
- Collection and analysis of data relating to the first ratoon crop of the replicated and randomised small plot N rate field experiments was completed.

During 2013–2014 the project will continue its nitrogen-rate field experiments into the second ratoon crop and Agricultural Production Systems sIMulator (APSIM) Growth Model will be calibrated with data collected from the first small plot nitrogen-rate field experiments. This project is scheduled to finish in 2013–2014 with submission of a PhD thesis.

STU074 – Joshua Howard – Production of furanics and chemicals from bagasse and molasses

(Funded October 2012 – April 2016)

The production of renewable alternatives to platform chemicals traditionally obtained from fossil fuel resources by upgrading sugar by-products presents an unprecedented opportunity for value-adding within the Australian sugar industry. The aim of the project is to develop processes for the production of furanics and other useful chemicals from bagasse and other by-products from the sugar manufacturing process.

During 2012–2013, the project has examined the production of furanics from bagasse and bagasse pulp using a biphasic strong acid hydrolysis system. The efficiency, conditions and products of this reaction were studied. It was found that this technique is capable of producing furanics in higher yields than conventional processes. The efficiency of the reaction significantly improved with the use of bagasse pulp.

During 2013–2014, the project will synthesis cheap, highly efficient, and robust solid catalysts for the fractionation bagasse into simple sugars and lignin. The activity of these catalysts will be assessed with the goal of developing a method for the production high value chemicals from bagasse and other by-products from the sugar manufacturing process.

STU076 Justin Sexton – Identifying and overcoming limitations in crop models with respect to drought tolerance and climate change

(Funded April 2013 – October 2015)

This James Cook University Masters by Research project aims to simulate breeder experiments that identify drought tolerance traits associated with higher sucrose yields in drier climates. This desktop analysis will be achieved using the Agricultural Production Systems sIMulator (APSIM). By identifying trait characteristics associated with drought tolerance, breeders will be better equipped to identify introgression experiments that will increase water use efficiency and increase yields in drier environments.

During 2013–2014 the project will produce a literature review on the new field of trait modelling for sugarcane. The project will also perform yield simulations for up to forty varieties of cane under a range of production environments, and compare results with yield data collected from field experiments to identify areas where current models may be improved. This will help build confidence in characterising different cane varieties within the APSIM modelling software. These simulations can lead to a better understanding of how variety traits influence yield variations.

STU077 Travis Wieck – Investigating the utility of mill mud for soil health conditioning and nutrient use efficiency on sodic soils within the Burdekin (Funded March 2013 – September 2016)

This University of Southern Queensland PhD project aims to discover the merits of mill mud in addressing soil health and nutrient use efficiency in sodic soils and to investigate value-adding to ameliorative potential through combined composting with gypsum (calcium sulphate dihydrous) and/or lime (calcium carbonate). Identification of the potential for mill mud to increase soil structural stability and infiltration rates in sodic soils through addition of calcium enriched composts, particularly within the Burdekin, will be investigated but this research will also be of benefit to other agricultural regions with sodic soils.

During 2012–2013 the project commenced by conducting a literature review considering mill mud (chemical composition, current management practices and legislation etc), the role of organic amendments in ameliorating sodic soils, nutrient use efficiency and benefits to soil health and plant productivity, and the effects of incorporating gypsum/lime in the composting process. Towards the end of the year, an experimental investigation into the chemical, physical and biological changes to the end composted product, via the addition of gypsum/lime, commenced.

During 2013–2014 the project will undertake a soil survey to understand the differences in soil properties between fields that had mill mud applied in the past and those that have not. An experiment to investigate the ability of the composted product to hold calcium in the soil, rather than leaching through the soil profile when subjected to an irrigation or rainfall event will also begin.

STU078 Maren Westermann – Effect of organic nutrients on sugarcane growth, microbial activity and greenhouse gas emissions (Funded March 2013 – September 2016)

This University of Queensland PhD project aims to quantify emissions of greenhouse gases (GHG) with focus on nitrous oxide (N₂O), but also fluxes of methane and carbon dioxide from sugarcane soils supplied with a range of organic fertilisers and soil amendments. The project will investigate the interactions between conventional and organic fertilisers, including animal manures and recycled crop and mill waste, to determine drivers of GHG emissions. Soil biological functions will be evaluated. This project will generate knowledge on the interactions between crop growth, nutrient and microbe formulations and GHG emissions in Queensland sugarcane systems to uncover how emissions can be reduced and crop growth and soil function promoted. In 2012–2013, laboratory-based microcosm research started testing hypotheses on drivers of N₂O emissions.

In 2013–2014, the PhD will test hypotheses on drivers of nitrous oxide emissions with field-based experimentation conducted in collaboration with Queensland state government and sugarcane growers.

Investment Program	Skills and Capabilities
Investment Category	D2 – Leadership and decision-making skilling
Deliverables and Measures of Success	<p>Provide events, mentoring training, scholarships, information and industry group support (funds, guidelines and staff) to:</p> <ul style="list-style-type: none"> ■ Increase farm and business managers and advisers’ awareness, capacity and skills to identify improvements and adopt associated technologies and best practices ■ Fill identified RD&E skills gaps in the industry ■ Support people in leadership positions to enhance their capacity to drive the industry forward ■ Develop and support effective relations across the value chain to drive the industry forward.
Outcome	<p>People within the sugar industry committed to a culture of education, learning and innovativeness and creating a sustainable sugar industry through:</p> <ul style="list-style-type: none"> ■ Increased innovation and adoption of viable technologies and best practices by farm and business managers and advisers ■ Stronger value chain relations increasing resource use efficiency and maximising revenue ■ Improved industry leadership through greater participation, skills and capacity ■ RD&E capabilities available to fulfil future needs of the industry.

SRD042 – TRAILBlazers leadership course for established leaders
(Funded March 2012 – October 2014)

The winner of the SRDC/SRA funded TRAILBlazers scholarship in 2013 was Geoff Kent from Queensland University of Technology. Coordinated by the Australian Rural Leadership Foundation, SRDC and SRA sponsored one placement for an established leader to attend the eight day TRAILBlazers course. The Program is for leaders who have been engaged in a range of roles for a significant period of time and who have worked in complex contexts. It provides an opportunity for these leaders to expand their leadership frameworks, concepts and strategies for a more resilient and robust approach to handling complex issues; establish new relationships and networks with other leaders across sectors and regions; and develop a fresh perspective and focus for their ongoing professional development and contribution to rural Australia.

ACF003 – Building future industry leaders
(Funded July 2013 – November 2014)

The project has been developed to encourage and support young sugar professionals to play an active role in their industry, both now and in the future. The project is designed to ensure that the future leaders in sugar are prepared to become the new face of the industry by supporting them to complete a future leader’s development course and to take part in an industry mentoring program.

The Future Industry Leaders mentoring program will trial a model with a small group of 12 participants in Queensland. The program will support the participants taking part in an accredited leadership development course. This project will create direct links between established industry professionals and the young farmers to provide ongoing support and aid in professional development. The aim is to equip these young farmers with the tools they need in order to contribute fully to the sugar industry to ensure a sustainable and viable future. A process and impact evaluation will be undertaken within twelve months of implementation.

Investment Program	Skills and Capabilities
Investment Category	D3 Business practices and value chain improvements
Deliverables and Measures of Success	<p>Provide events, mentoring training, scholarships, information and industry group support (funds, guidelines and staff) to:</p> <ul style="list-style-type: none"> ■ Increase farm and business managers and advisers' awareness, capacity and skills to identify improvements and adopt associated technologies and best practices ■ Fill identified RD&E skills gaps in the industry ■ Support people in leadership positions to enhance their capacity to drive the industry forward ■ Develop and support effective relations across the value chain to drive the industry forward.
Outcome	<p>People within the sugar industry committed to a culture of education, learning and innovativeness and creating a sustainable sugar industry through:</p> <ul style="list-style-type: none"> ■ Increased innovation and adoption of viable technologies and best practices by farm and business managers and advisers ■ Stronger value chain relations increasing resource use efficiency and maximising revenue ■ Improved industry leadership through greater participation, skills and capacity ■ RD&E capabilities available to fulfil future needs of the industry.

ACF002 – A pilot for Business Planning for young farmers and partners in the sugarcane industry (Funded June 2013 – April 2014)

Given the aging demographic of sugar cane farmers it is important that young farmers, the future decision makers of the industry, are provided with the tools and skills needed for them to succeed in their farming businesses.

This project will provide young farmers and their partners with the knowledge of how to better understand and manage their business to help them make informed decisions about their farming future through intensive business management training. Benefits derived from this initiative will be on-going at both a regional and state level and will assist in the sustainability of the sugar industry through development of young farmers with strong business skills who can provide leadership. Business Planning is about the future, and these farmers represent the industry's future.

DPI022 – Cropping solutions for the sugarcane farming systems of the Burdekin (Funded July 2011 – June 2014)

This research project will complete an integrated study of Burdekin farming systems involving sugarcane, grains, grain legumes and cotton. The project is led by the Queensland Department of Agriculture and is jointly funded by SRDC and Grains Research and Development Corporation with additional in kind support provided by BSES and CSIRO. The project will conduct baseline studies to determine the feasibility and likely productivity issues associated with developing an integrated farming system involving sugarcane, with possible rotation crops such as maize, grain legumes and others in the Burdekin Irrigation area.

This project will develop much needed data that will clearly define the impact of planting date on cane productivity and profitability and how this is influenced by different break crop species and duration of cropping. Importantly, this project will also seek to optimise agronomic production packages for grain legumes and maize within these defined seasonal windows.

During 2012–2013 this project undertook a significant trial program in grain legume agronomy with a series of detailed experiments at the Ayr Research Station examining the interactions between variety, plant density and sowing date of both mungbeans and soybeans. These experiments commenced in August 2012 with a mungbean trial. Further plantings of mungbeans were made in February 2013 with the two final plantings planned in August and September 2013. Three planting dates of soybeans occurred over the summer period, with a further three plantings commencing in May 2013 and continuing over the early winter.

The large cane rotation trial at Mona Park has seen the long fallows rotate through summer soybeans (or cotton), winter maize, summer mungbeans before being planted back to cane in April 2013. All of the short fallows have been replanted to cane after the different length fallow periods. Only the last cotton fallows await cane planting which will occur in late July 2013. A thorough sampling program is underway to assess biomass and growth trends from the different treatments with the first cane harvest from the block expected in July 2013.

During 2013–2014 this project will continue trial work on the large cane rotation field trial at a grower cooperator's farm in the Mona Park area. This trial is the combination of two experiments looking at the impacts of different fallow treatments and lengths on sugarcane productivity. Experiment 1 compares different fallow lengths (either bare or legume fallow) and the impact on cane yield from the different times of cane planting. Experiment 2 examines long fallows (18 months) with different combinations of soybeans, maize, mungbeans and cotton.

Component agronomy trials in grain legumes are underway at the Department of Agriculture, Fisheries and Forestry Ayr Research Station. To date, trials in mungbeans and soybeans have examined the interactions between variety, time of planting and plant population on grain quality and yield. Much of 2013 will be taken up with these detailed agronomic trials. Best performers and treatments from these trials will then be subject to further trials in 2014. Off station agronomic trials will also continue in mungbeans and soybeans in nutrition, weed and insect management.

MSF007 – Boosting productivity in Maryborough by assisting cane growers to understand their soils (Project funded January 2013 – March 2014)

This Capacity Building Project aims to boost productivity and land use sustainability in Maryborough by assisting cane growers to understand their soils through the identification and management of subsoil constraints, and selection of the most suitable sugarcane variety for a soil type. It is expected that the project will produce a soil map in conjunction with the cane growers in the Bauple cane growing area to enhance property planning and decision-making on-farm.

OHS003 – Primary Industries Health and Safety Partnership (Funded July 2013 – June 2016)

SRA will continue to participate in the collaborative Research and Development Corporation program (previously known as the 'Collaborative Partnership for Farming and Fishing Health and Safety'). The Program is managed by the Rural Industries Research and Development Corporation (RIRDC) on behalf of program partners Cotton Research and Development Corporation, Fisheries Research and Development Corporation, Grains Research and Development Corporation and SRDC.

The Program is a key investor in research that informs farming and fishing health and safety activities at both on-farm and policy development levels. The Partnership is a key investor in research that informs farming and fishing health and safety. During 2013–2014 the Primary Industries Health and Safety Partnership will continue under the management of the Rural Industries Research and Development Corporation and will seek to expand the program resources. The following priorities will be pursued generically across the primary industries and in relation to the sugar industry (where deemed relevant):

- reducing injuries and deaths
- improving mental health of owners, managers and workers in the sector
- improving the physical health of owners, managers and workers in the sector.

RIRDC is working with existing and new collaborative partners to set the strategic direction for the program beyond 1 July 2013.

RESEARCH PROJECT SUMMARIES

Projects currently funded by the Collaborative Partnership:

Cross contamination by chemicals of farming family members

The South East Premium Wheat Growers' Association is leading this project in collaboration with the Combined Universities Centre for Rural Health. Exposure to chemicals is one of the biggest risks to farmers, their families and employees. The overall aim of the project is to encourage people to be more aware of how they are handling chemicals to reduce the risk of preventable diseases. This project is a pilot study with the vision that it will be replicated in other parts of Australia and industries outside grains such as cotton and sugar. The final report of the project is due in 2013.

Drug and alcohol use by farming and fishing workers

This project led by the Lyndon Community is investigating farm and fishing workers' use of drugs and alcohol, the effects on their physical and mental health and how this relates to workplace health and safety. The project has two stages. The first is identifying farm and fishing workers' knowledge, perceptions and use of drugs and alcohol, their experiences of drug and alcohol related harms (physical and mental) and the influence of workplace culture on drug and alcohol use. A second stage will trial the implementation of a multi-component intervention package to reduce alcohol and drug-related harms among farm and fishing workers and improve workplace health and safety. A final report on Stage 1 was completed in June 2012 and funding for Stage 2 secured in July 2012.

Investment Program	Skills and Capabilities
Investment Category	D4 Extension and adoption of research
Deliverables and Measures of Success	<p>Provide events, mentoring training, scholarships, information and industry group support (funds, guidelines and staff) to:</p> <ul style="list-style-type: none"> ■ Increase farm and business managers and advisers' awareness, capacity and skills to identify improvements and adopt associated technologies and best practices ■ Fill identified RD&E skills gaps in the industry ■ Support people in leadership positions to enhance their capacity to drive the industry forward ■ Develop and support effective relations across the value chain to drive the industry forward.
Outcome	<p>People within the sugar industry committed to a culture of education, learning and innovativeness and creating a sustainable sugar industry through:</p> <ul style="list-style-type: none"> ■ Increased innovation and adoption of viable technologies and best practices by farm and business managers and advisers ■ Stronger value chain relations increasing resource use efficiency and maximising revenue ■ Improved industry leadership through greater participation, skills and capacity ■ RD&E capabilities available to fulfil future needs of the industry.

BCA002 – Performance evaluation of SRDC R&D investments*(Funded July 2007 – September 2013)*

SRDC and other Research and Development Corporations undertake an annual review of investments. Each Corporation has agreed to identify the outcomes and benefits that have emerged or are likely to emerge from their investment in research, development and extension through a standardised sampling and reporting framework.

In 2012–2013 the evaluation involved analysis of four clusters of SRDC projects in the areas of: Improved capability for leadership; Enhancing cost-efficiency in milling systems (Juice extraction and whole of system); Enhancing cost-efficiency in milling systems (Juice processing); and Diagnostic technologies for genetic screening. Analyses showed cost:benefit ratios between 2.44 to 3.39 for these clusters.

In 2013–2014 the project will again select several clusters of completed SRDC funded projects and determine their benefit:cost ratios.

GGP064a – Pachymetra awareness project for Condong mill area*(Funded July 2012 – December 2014)*

Pachymetra root rot is known to reduce yields by up to 40 per cent, and even greater yield reductions have been seen at Condong. This grower group project led by growers from the Condong mill region in New South Wales aims to use innovative approaches to demonstrate the potential benefits of, and promote, improved Pachymetra management on-farm. This project will build capacity in growers to better manage Pachymetra on their cane farm.

During 2012–2013 the project trial sites were selected and samples were collected. At each site variety strips were planted to compare varieties rated as susceptible, intermediate and resistant to Pachymetra. Prior to planting all candidate sites were sampled for Pachymetra. Trial sites were then prepared according to soil tests and then planted.

In 2013–2014 the project will conduct field walks that will demonstrate the impact of Pachymetra susceptible varieties as well as resistant varieties. Trial sites will be harvested and trial data will be collated. Trial information will be utilised in an innovative process to build capacity in the New South Wales sugar industry cane growers.

NCA013 – Implementing a framework for farmers to engage in the use of Precision Technologies*(Funded July 2012 – September 2015)*

This research project, led by the National Centre for Engineering in Agriculture, aims to offer training in the fundamentals of precision agriculture and the development of a framework to ensure the highest benefits available flow to a grower upon implementation of a technology. The framework will use well defined quality control and continuous improvement methods based on Hazard Analysis Critical Control Points to determine critical areas of potential improvement in current practices. During 2012–2013 the project has:

- Collated precision agricultural material for use in the training workshops. This material has been drawn from other industries (particularly grain) but the material to be presented at the workshops will have a sugar focus.
- Collaborated with the Professional, Extension and Communications (PEC) unit to schedule training events. Two workshops are currently being planned.
- Procedures are being put in place to employ the project officer who will contribute to developing the HACCP framework.
- A pilot survey of the HACCP questionnaires has already been delivered to several growers.

During 2013–2014 the project will present the final two precision agriculture workshops and identify individuals interested in helping to develop the HACCP framework. The workshop material will be made freely available and the project team will start the industry wide engagement of the HACCP principles.

WS009 – RD&E Communication*(Funded July 2012 – June 2017)*

In June 2013, the SRDC Board approved the SRDC Transition and Closure Communications Strategy. The primary goal of this strategy was to inform SRDC stakeholders and service providers of SRDC's closure date on 30 September 2013 and this was implemented by SRDC between 1 July and 30 September 2013.

Research projects approved in 2012–2013 to start from 1 July 2013.

In January 2013, SRDC announced the allocation of approximately \$1.8 million to fund 14 new research projects for the sugarcane industry from 1 July 2013.

Projects will be delivered by SRA, CSIRO Plant Industry, Queensland University of Technology Centre for Tropical Crops and Bio-commodities, CSIRO Entomology, CSIRO Ecosystems Sciences, QUT Science and Engineering Faculty, University of Southern Queensland and the Queensland Department of Agriculture, and will be overseen by SRA.

The rigorous selection process involved reviews of 82 Expression of Interest applications by technical research and industry reviewers from Australia and overseas, in late 2012.

Shortlisted applications were then assessed by a panel of experts from research institutions, government, and SRDC's Representative Bodies – including Canegrowers, Australian Cane Farmers Association and Australian Sugar Milling Council. Shortlisted applicants presented verbally through face to face presentations and answered questions from the assessment panel.

The number of outstanding research applications received in 2012–2013 far outweighed the amount of funding available – creating competitive debate during the selection process. The 14 successful projects will provide strong social, economic and environmental returns for the sugarcane industry and are aligned to National, Rural and Industry research priorities. The projects will also support some significant research focused in the short, medium and long-term.

Twelve other projects were also funded after similar assessment panels considered applicants. Funding was approved for three SRDC PhD Scholarships, five Grower Group Innovation Projects and five Capacity Building Projects.

Growing the crop

A1 – Plant genetics

BSS358 – Developing cytogenetic and molecular tools to improve selection for soil-borne pathogen resistance in wild hybrids **(Funded July 2013 – June 2016)**

This new three-year SRA led research project hopes to develop cytogenetic/molecular marker-based methods to select potentially high-value progeny from the introgression program. These methods will allow breeders to short-circuit traditional breeding by allowing early selection on progeny based on molecular markers rather than traditional resistance screening.

In 2013–2014 the project will implement cytogenetic techniques on approximately 30 *Erianthus* sugarcane hybrids and characterise the chromosomal composition of each clone. At the same time, a set of unique PCR (Polymerase Chain Reaction) primers will be developed that allow identification of specific *Erianthus* chromosomes. This will allow the characterisation of the *Erianthus* chromosome complement of large numbers of intergeneric hybrids. The primer set will then be available to screen all *Erianthus* hybrids in the future. Phenotypic screening for *Pachymetra* root rot and nematode resistance will also be undertaken. Association between the chromosome specific markers and the disease resistance data will be carried out to determine if the chromosomes that carry the resistance genes can be identified.

CPI028 – Accessing stress resistant sugarcane and sugarcane research investment in China **(Funded July 2013 – June 2017)**

This new four-year research project, led by CSIRO Plant Industry, will aid the development of a partnership with breeding programs in China. Yunnan Academy of Agricultural Sciences is proposing a large program in China to develop high yielding and water efficient varieties. Australian breeding programs will obtain access to outputs from this program in return for some technical advice and assistance.

During 2013–2014, the project will finalise a detailed work plan in partnership with research partners in China. It will also begin field and pot trials in China

(Yunnan) using basic germplasm clones from the Chinese National sugarcane germplasm collection, and a set of commercial type clones selected from Chinese breeding programs.

The pot trial experiments will aim to identify clones with high transpiration use efficiency that may be of value to incorporate into our commercial breeding parent collection in Australia. The field trials in China will be conducted following similar procedures as followed in the project BSS334, and expected to provide further validation and testing of hypotheses developed in Australia. Results from the project will be progressively used to identify promising clones to import to Australia from China, and to develop improved selection methods for selecting clones with higher yields under water limited environments and with higher water use efficiency.

CPI029 – Selecting for favourable plant x soil water interactions

(Funded July 2013 – June 2017)

This new four year research project, led by CSIRO Plant Industry, will screen a large range of potential parental germplasm for traits conferring higher yields under limited soil water conditions. The key focus will be on the trait transpiration efficiency, defined as biomass growth per water lost through transpiration. Clones which can produce high biomass per unit water loss without sacrificing rate of growth are expected to produce higher yields under water limited rain-fed environments, and higher yield per unit irrigation applied. Clones from within existing breeding programs, and exotic clones not yet incorporated into breeding programs will be screened during the project. Identifying clones with higher levels of water use efficiency than existing cultivars will facilitate the introgression of this trait into commercial cultivars.

During 2013–2014 the project will develop optimal methods for screening for transpiration efficiency, using a combination of leaf level gas (CO₂ and water vapour) exchange measurements and whole plant measurements of water use and biomass production, and provide a report on recommended procedures to follow in the remainder of the project. This work will build on research already conducted in related project BSS334. A set of clones to be screened during the project will be selected, with the number determined by the screening protocols developed in the initial experiment. These clones will be chosen

in consultation with Australian sugarcane breeders, and include elite parents from the existing commercial breeding program, and a sample of clones recently derived from wild canes. The first phase of screening of these clones will commence in 2014.

CPI030 – Applying the genome sequence for variety improvement: validation of BAC gene markers and development of high throughput markers for implementation

(Funded July 2013 – June 2018)

This new five-year research project, led by CSIRO Plant Industry, aims to take the current single sequence repeat gene markers and Diversity Array Technology (DArT) markers that underlie traits of agronomic importance and convert them to single nucleotide polymorphism (SNP) markers which are more amenable to high throughput methods of screening. The project will firstly validate the selected markers and secondly develop a cost effective high throughput SNP system to implement them in the current breeding program.

In 2013–2014 the project will validate the markers that have been linked to important agronomic traits in a wider set of sugarcane germplasm. Then, sequencing of the validated regions will be carried out to identify SNP markers that can be used in the sugarcane breeding program.

NSC022 – Exploiting introgression for the development of productive and regionally adapted varieties for NSW

(Funded July 2013 – June 2020)

This new seven-year research project, led by NSW Sugar Milling Cooperative, will explore the variety improvement opportunities available through introgression. Introgression offers access to genes in wild sugarcane related germplasm that may be suitable to two year old cropping or frosting. The project will fast-track clones from existing research project BSS344 into the NSW two-year cropping cycle selection program.

In 2013–2014 the project will propagate selected clones from BSS344 (and other sources, for example ex-CSR cold tolerant materials still available) in readiness for incorporation into the NSW two-year cropping final-stage trials. These clones, together with clones from the variety exchange program, will also

be planted in observation plots in a frost prone area to be assessed for cold-tolerance. Additional clones in the final stage trials will be assessed as for the routine program (cane yield and CCS levels), but will have additional cold-tolerant data collected from the observation plots.

Growing the crop

A2 – Pest control

BSS356 – Mass production of the Adelina disease to better manage greyback cane grubs (Funded July 2013 – June 2016)

This new three-year research project, led by SRA, will investigate the feasibility of producing *Adelina*, a pathogen of the cane grub, on large scale. Two methods will be trialled for production; conventional laboratory breeding and cell culture breeding. The resulting *Adelina* will be tested for its ability to infect healthy grubs and may possibly be used for an *Adelina*-based biocide.

BSS357 – Innovative approaches to identifying the cause of chlorotic streak and new management strategies (Funded July 2013 – June 2016)

This new three-year research project, led by SRA, hopes to identify the causal agent for chlorotic streak, develop a diagnostic assay and understand disease transmission in an effort to better manage the disease.

In 2013–2014 the project will conduct further testing of a chlorotic streak DNA assay developed prior to the start of the project. The assay is based on a sequence from the gene that codes for a protein known as actin. This sequence will be used to identify more DNA sequences specific for the cause of chlorotic streak and this information will enable searches of world-wide databases for any organisms that match the chlorotic streak-associated DNA. The chlorotic streak specific DNA will also be used to probe infested roots and stems so that the causal organism can be visualised under a microscope. The diagnostic assay will be used to monitor water in hydroponic tanks containing diseased plants to determine how the disease agent moves from diseased to healthy plants. Novel treatments such as specific biocides will be tested to provide additional evidence for likely organisms that cause the disease.

The glasshouse hydroponic tanks will also be used to screen a range of commercial varieties for resistance to chlorotic streak and the results of the glasshouse studies will be compared to reaction of the varieties in a chlorotic streak infested field trial.

BSS362 – Solving the Yellow Canopy Syndrome (YCS) (Funded June 2013 – June 2014)

This new project aims to solve the sugarcane YCS that is currently in evidence in several crop stages in the Northern, Herbert and Burdekin districts of Queensland. It will be run as a collaborative venture involving several key players and organisations that will contribute ongoing expertise and input. The main objectives of this initiative are : To provide leadership in terms of industry focus and communication around YCS as well as to provide industry with a single point of contact that focuses effort in a way that maximises the probability of a rapid diagnosis and if applicable, to provide appropriate management guidelines; To identify the causative factors of the syndrome by establishing a series of monitoring sites on-farm, and within existing variety (FAT) and agronomy trials in the Burdekin and Herbert regions, and by means of appropriate supporting investigations; To develop initial strategies to mitigate against possible cane losses associated with the condition. Finally, the project will also assess the ability of remote sensing to detect the YCS symptoms at a field scale.

CES001 – Rapid detection of ratoon stunting disease (Funded July 2013 – May 2016)

This new three-year research project, led by CSIRO Food Futures Flagship, aims to develop a rapid 'sniff test' to diagnose ratoon stunting disease using a new technology called 'E-nose' or electronic nose. During 2013–2014 the project will be dedicated to find volatiles associated to ratoon stunting disease. Headspace volatiles will be collected from clean sugarcane sap and sugarcane sap infected with *L. xyli xyli*. Headspace profile of the infected and uninfected samples will be compared and determine whether there are individual volatile organic compounds or patterns of volatile organic compounds that can reliably discriminate infected from uninfected sugarcane. Finally gas chromatography-mass spectrometry results will be compared to traditional enzyme based ELISA results and sample metadata (geographical origin, genotype, environmental and agronomic conditions), using multivariate analysis.

CSI001 – Strategies to manage soil-borne fungi and mitigate sugarcane yield decline*(Funded July 2013 – June 2016)*

This new three-year research project, led by the CSIRO Sustainable Agriculture Flagship aims to characterise soil and rhizosphere fungal communities in two differing sugarcane farming systems and define the dynamics of key pathogenic and disease suppressive microbes.

During 2013–2014 the project will commence characterising soil-borne fungal communities in sites previously identified as exhibiting sugarcane yield decline. Comparisons of fungal inoculum and root infection levels in continuous cane and cane-legume rotations will identify key pathogenic and potentially disease suppressive fungi in these systems. Molecular biological approaches for fungal community analyses will be tested and optimised for soil types and crop species.

CSI002 – Rapid detection of ratoon stunting disease*(Funded July 2013 – June 2016)*

This new three-year research project, led by CSIRO Food Futures Flagship, aims to develop a rapid 'sniff test' to diagnose ratoon stunting disease using a new technology called 'E-nose' or electronic nose.

During 2013–2014 the project will be dedicated to finding volatiles associated with ratoon stunting disease. Headspace volatiles will be collected from clean sugarcane sap and sugarcane sap infected with *L. xyli xyli*. The headspace profile of the infected and uninfected samples will be compared and it will be determined whether there are individual volatile organic compounds or patterns of volatile organic compounds that can reliably discriminate infected from uninfected sugarcane. Finally, gas chromatography-mass spectrometry results will be compared to traditional enzyme-linked immunosorbent assay (ELISA) results and sample metadata (geographical origin, genotype, environmental and agronomic conditions), using multivariate analysis.

Milling the crop**B1 – Mill capital use and operating efficiency****QUT059 – A retrofit to a mill to reduce its operational and maintenance costs***(Funded July 2013 – August 2016)*

This new three year research project, led by the Queensland University of Technology, plans to remove the delivery (final) roll and trash plate from the milling unit design as a means of reducing maintenance and operating costs of a milling unit. This will result in a five-roll mill design and reduce compressions through the milling unit thereby 25 per cent. This project will also develop a concept design and address issues associated with retrofitting the design to the second milling unit at Harwood.

QUT060 Reducing the maintenance costs of mill rolls*(Funded June 2013 to August 2017)*

Each year, Australian sugar mills spend about \$15 million maintaining mill rolls. The largest costs come from reshelling and arcing (roughening) the roll surface. A typical milling train contains 25 rolls with roll life of two to six years. During the season, roll shells require regular arcing to maintain roughness. An SRDC funded project (SRI137) developed an alternative process involving higher strength (and cost) SG iron roll shell material and a weld procedure with tungsten carbide chips to provide a rough roll surface without arcing. Although the process was shown to have lower whole-of-life costs and extended top roll life from two years to six years, the approach has not been adopted. The need for the higher cost SG iron roll shells with greater quality control during manufacture and which could not easily be arced are seen as the main impediments to the take up of this technology.

This project will assess the feasibility of using plasma transfer arc welding to increase the durability and maintain the surface roughness of mill rolls to reduce their whole of life costs and develop techniques for application of materials to the surface of a mill roll. Costs and durability of the surface coating will also be assessed.

Sustaining the environment

C1 – Positioning industry as a leader in environmental responsibility

DPI025 – Developing remote sensing as an industry wide yield forecasting, nitrogen mapping and research aide

(Funded May 2013 – October 2016)

This new three-year research project, led by the Queensland Department of Agriculture, Fisheries and Forestry, has three objectives: refine the accuracies and delivery of crop, farm and regional scale yield forecasts derived from satellite imagery; evaluate multispectral and hyperspectral tools as a method for screening research and breeding trials; and evaluate multispectral and hyperspectral tools as a method for measuring canopy nitrogen status.

During 2012–2013 the precursor to this project captured SPOT5 imagery over all locations with yield estimates and derived yield maps provided to all relevant parties. High resolution eight band imagery has been captured over two University of Queensland/SRA varietal nitrogen trial sites in Mackay and the Burdekin, with analysis of this new data to begin in 2013–14 once trials have been harvested.

During 2013–2014 the project will continue to refine and develop regional yield forecasts from SPOT5 imagery for the growing regions of Herbert, Mulgrave, Burdekin, Maryborough, Bundaberg, Isis and New South Wales, and improve the predictive accuracies at the block level through new variety and class specific algorithms. New methods for automating the forecasting process will be investigated in order to further support industry adoption. The project team in collaboration with University of Queensland, James Cook University and BSES will investigate hyperspectral and multispectral imagery as tools for screening genotypes within existing breeding and field trials.

Sustaining the environment

C3 – Preparing for global environment with different resource availability and values

BPS002 – Sodic soils and rising groundwater table management in the Burdekin

(Funded July 2013 – September 2013)

Sodic soils are a production limiting issue for large areas of the Burdekin region. Saline soils, saline groundwater and rising groundwater tables also have a high possibility to further limit yield potential. Rising groundwater levels are a very serious threat and there is some urgency in being able to efficiently deal with the issue. Many growers and advisors in the region are not well educated about the interaction between all of these factors, as well as the most appropriate management strategy.

This project aims to educate growers and advisors in the underlying science of sodic/saline soils and groundwater interaction and discuss management options in a range of scenarios.

USQ004 – Developing targeted, seamless weather and climate forecasting systems for critical early season harvest periods

(Funded July 2013 – June 2016)

This new three-year research project, led by Australian Centre for Sustainable Catchments at the University of Southern Queensland, aims to develop a pilot system targeted for important sugar production regions that will offer greatly improved weather and seasonal climate forecasts for critical harvest periods.

During 2013–2014 the project will critically examine the capabilities of both (published) statistical and 'new generation' dynamic coupled ocean-atmosphere climate forecasts (developed in Australia and internationally) to provide forecast output for specific critical periods of the year. This research will have direct implications for the management of sugar harvesting in Australia.

In addition, a number of industry management workshops will be conducted in sugar production regions to better identify those critical decision-systems, decision periods and types of forecast output needed to better meet the needs of industry.

Grower Group Innovation Projects (GGIPs) approved in 2012–2013 to start from January 2013.

In January 2013, SRDC committed approximately \$275,000 to fund five new research projects to be led by sugarcane grower groups over the next three years. These five new Grower Group Innovation Projects are in addition to the fifteen existing projects currently being delivered across sugarcane growing regions in Queensland and New South Wales.

Growers are an often unrecognised source of new ideas and through this program, growers have proven their willingness to embrace innovation and investigate ways to improve farming systems and technology to increase crop yields. Through group work and farm trials, these growers support other cane growers to develop their ideas, to consider adoption of the latest RD&E outcomes and to improve economic and environmental performance.

These group projects are designed by growers for growers. They allow growers to identify local issues and use research and development techniques to find solutions of benefit to the whole industry. By pooling ideas, experience and enthusiasm, growers have the ability to make significant changes to their industry with support from researchers in their own region.

The new Grower Group Innovation Projects in 2013 aim to:

1. Investigate the role of microbes and carbon in soil-plant interactions in Burdekin sugarcane soils.
2. Quantify the effects of microbial additions to sugarcane soils on crop productivity in the Burdekin, Herbert, Proserpine and Mackay regions.
3. Develop an innovative, high flotation, and affordable high rise spray unit in the Innisfail region.
4. Design strategies to limit the impact of nematode pressure on sugarcane productivity in the Isis region.
5. Ameliorate clay sub soils to increase water availability to improve crop yields in the Maryborough region.

GGP068 – Investigating the role of microbes, carbon in soil-plant interaction in Burdekin sugarcane soils – Tom McShane – Advance Burdekin Collective Research Group.

Project Duration: January 2013 – March 2015.

There has been a growing interest in the Burdekin sugarcane industry in utilisation of soil microbes and other ameliorants to improve soil health, increase soil carbon, improve soil productivity and enable better

utilisation of natural and applied nutrients. The aim of this project is to determine whether by increasing soil microbiological activity there can be agronomic gains through (a) suppression of “bad pathogens”; (b) increasing soil carbon and (c) increasing the availability of “soil pool” nutrients. This project will complement and add value to SRDC funded projects conducted by researchers at the University of Queensland (UQ043 and STU070). This project aligns with SRDC’s investment area *Growing the Crop*, giving particular attention to the call priority of *Plant-Soil Interactions*.

GGP069 – Quantifying the effects of microbial additions to sugarcane soils on crop productivity – Jayson Dowie – Biologically Active [Group] (Burdekin, Herbert, Proserpine, and Mackay)

Project Duration: January 2013 – June 2015.

This project will establish trial sites across four areas including; in the Burdekin on burnt and green-cane trash blanket furrow irrigated sites, in Proserpine in controlled traffic plant cane, in Mackay on green-cane trash blanket ratoons, and in the Herbert in an area allowing investigation of soil biology in sugarcane soils under different production systems. This project seeks to quantify changes to soil physical properties (bulk density), chemical balances (nutrient availability), and moisture content (water holding capacity), as well as measuring parasitic and beneficial nematode populations as a result of soil microbial activity. This project will complement and add value to other SRDC funded projects conducted by researchers at the University of Queensland (UQ043 and STU070). This project aligns with SRDC’s investment area *Growing the Crop*, giving particular attention to the call priority of *Plant-Soil Interactions*.

GGP070 – The Mantis – developing an innovative, high flotation, affordable high rise spray unit – Wayne Gattera – Gattera & Devaney [Group] (Innisfail)

Project Duration: January 2013 – December 2013.

This project will design and develop an innovative and affordable self-propelled spray rig that is able to spray in areas not accessible by current machines. Additional outputs from this project will be improved timing of herbicide applications that will allow a reduction in the use of residual herbicides for long term weed control. This will cut residual herbicide rates and increase operator safety due to improved

stability. This project aligns with SRDC's investment area *Growing the Crop*, supporting the investment category *Pest Control*.

GGP071 – Strategies to limit the impact of nematode pressure on sugarcane productivity in the Isis. Bruce Quinn – Isis Productivity Group [Grower Nematode Group] (Isis)

Project Duration: January 2013 – July 2014.

This project will evaluate sugarcane variety tolerance to Plant Parasitic Nematode populations with an aim to reduce production losses caused by nematode damage in the sugarcane crop following various fallow cropping strategies. The outputs of this project will enhance the knowledge and understanding of growers and land managers of the importance of following a nematode management strategy and its incorporation into fallow cropping management strategies. This project aligns with SRDC's investment area *Growing the Crop*, giving particular attention to the call priority of *Plant-Soil Interactions*.

GGP072 – Ameliorating clay sub soils to improve crop yields – Glen Grohn – DAG Group (Maryborough)

Project Duration: January 2013 – December 2014.

This project aims to facilitate an increase in sugarcane yields on duplex soils in the Maryborough Cane Supply area through the development of a method to ameliorate a sub soil constraint that would result in increasing water availability to the sugarcane crop. The project will develop a machine/implement that is capable of applying compost or mill mud to a clay sub soil that starts at a depth of 200–300mm. This will ameliorate the crop root constraints of clay sub soils.

This project will complement and add value to other SRDC funded projects conducted by other Grower Groups throughout the industry (GGP067, GGP062, GGP061 and GGP059). The project aligns with SRDC's investment area *Growing the Crop*, giving particular attention to the call priority of *Plant-Soil Interactions*.

University scholarships approved in 2012–2013 to commence from 1 July 2013

In February 2013, SRDC announced funding for three postgraduate university students: Justin Sexton from James Cook University, Maren Westermann from University of Queensland, and Travis Wieck from University of Southern Queensland.

A broad field of twenty high calibre students applied for a 2013 SRDC funded scholarship and the process was extremely competitive. The three students have commenced PhD or Masters research linked to the sugarcane industry and have received a Sugar Research and Development Corporation (SRDC) Scholarship.

Justin Sexton will identify ways to overcome limitations in crop models with respect to drought tolerance and climate change in project STU076.

Maren Westermann will research the effect of organic nutrients on sugarcane growth, microbial activity and greenhouse gas emissions in project STU078.

Travis Wieck will investigate the utility of mill mud for soil health conditioning and nutrient use efficiency on sodic soils within the Burdekin in project STU077.

SRDC's decision to create a postgraduate scholarship program, has been extremely successful with 78 scholarships being offered over the past ten years. During this time, sugarcane researchers have achieved significant breakthroughs, from developing new sugar cane varieties with pest and disease resistance – to adding value to the national crop by creating diversification products.

Capacity Building Projects approved in 2012–2013 to commence from 1 July 2013

In early 2013, SRDC announced funding for five Capacity Building Projects (CBP). The CBP program was designed for individuals and groups who are keen to extend their experience and professional knowledge to be of further value to the industry. Throughout rural Australia there are many examples of innovative agricultural practices that can be adapted to sugarcane growing and product diversification, and many people with knowledge, systems and technology who are willing to share. The success of a project is based on the outcomes it will deliver including increased competency, a greater understanding, its potential to be a catalyst for innovation. The project must also align with SRDC's identified goals for that year.

The benefit to the whole industry is in the commitment of those undertaking a capacity building project to share their new-found knowledge and experiences widely and to document their findings.

BSS355 – Enhancing sugar mill operating efficiency using integrated laboratory NIR instruments and networked systems, Dr David Donald, SRA, Meringa

NIR currently is used as the basis for cane payment in many Australian sugar mills. It is now being acknowledged and implemented by mills as a means of measuring moist components in the processing stream of sugar mills (and refineries). NIR calibrations are now available for sugar cane, juice, bagasse, molasses, massecuite, raw wash, boiler water, magma, mill mud, boiler ash and raw sugar.

The focus of this Capacity Building Project was to support Dr David Donald's presentation to NIR-2013, the 16th Annual Conference on Near Infrared Spectroscopy in Montpellier, France in June 2013. Dr Donald also attended a number of associated workshops on advanced Chemometrics. The conference has given Dr Donald the opportunity to explore ways of best devising, controlling, managing and supporting the integrated NIR system encompassing these measurements and their process control opportunities. The knowledge gained from this conference will enhance the development of methods and measurement techniques to manage this science in high moisture environments.

BSS354 – Assessment of the current state of phytoplasma sugarcane diseases in SE Asia.

Dr Rob Magarey, BSES, Tully

The Biosecurity risk associated with the voluminous movement of materials throughout SE Asia (through transmigration) constitutes a significant threat to the Australian sugarcane industry. Phytoplasmas cause significant loss in SE Asian cane fields but are not currently thought to exist in Australia. With no known sources of resistance to the organisms in the Australian germplasm, any incursion would be a significant challenge to the industry.

International research originally identified Phytoplasmas as the causal agent for yellow leaf syndrome. Recent international research now validates some Australian research undertaken 15 years ago challenging this association. This project provided travel for Dr Magarey to visit Thailand and Vietnam to gain a better understanding of the phytoplasma causing diseases (white leaf, grassy shoot and green grassy shoot) which exist there and which pose a significant Biosecurity challenge to the Australian sugar industry.

Dr Magarey also attended the International Society of Plant Pathology Conference in Beijing. The focus of the field visits will be on issues relating to transmission and resistance screening methods.

DPI024 – Irrigation Bus Tour – Extension of MAF002, Evan Shannon, Davco Farming, Burdekin

Capacity Building project provided funding for fifteen growers from the Burdekin to the wet tropics and Atherton Tableland areas to explore different irrigation practices and to identify ways of overcoming management issues experienced with furrow irrigation in the Burdekin and the introduction of green cane trash blanketing systems there.

MSF007 – Boosting productivity in Maryborough by assisting cane growers to understand their soils, Andrew McDougall, Maryborough Productivity Services, Maryborough

This project supported the development of a suitable and appropriate soil map of the Bauple area of the Maryborough mill area. No such maps exist for the area and this is regarded as a significant resource in helping the growers of the area develop a better understanding of their production limitations. A grower engagement strategy was used in the development of the maps and technical support relating to soils was provided by the Department of Natural Resources and Mines. The mapping process involved a series of grower meetings and field days and the use of appropriate soil pits dug in the area to highlight the detail of the soil profiles in the area and their implication for crop management systems appropriate to the area. The project was also supported by Reef Rescue funding and Maryborough Productivity Services.

QUT041 – Enhancing and broadening knowledge of evaporation processes through attendance at the ISSCT Congress. Omkar Thaval, QUT, Brisbane

With the support of Capacity Building Project, Omkar Thaval of the Queensland University of Technology, attended the June 2013 International Society of Sugarcane Technologists Conference in Brazil and was able to take advantage of the conference to seek out and better understand the operation of evaporator technology installed in a range of Brazilian sugar mills. The Brazilian mills of interest have Robert type vessels, rising film plate heat exchangers, Kestner and Semi-Kestner vessels. Australian mills mainly have only the Robert type installed.

Section 4

Statutory Reporting

- Due diligence
- Management
- Compliance with the Commonwealth Authorities and Companies (CAC) Act 1997
- Risk Management
- Protective security
- Intellectual property management
- Environment Protection and Biodiversity Conservation Act
- Privacy Commission
- Freedom of Information
- Work Health and Safety



Due diligence

At its Audit Meeting on 26 August and Board Meeting on 30 August 2013, the Board and its Audit Committee confirmed that all decisions had complied with the requirements of the due diligence checklist.

Management

The Corporation's Business Process Management System (BPMS) was an essential tool to manage risk and control fraud and provided quality assurance for the daily management of the SRDC. Its annual audit was overseen by the Audit Committee and undertaken by an agent of the Australian National Audit Office. This system was transferred to SRA in August 2013 and no further auditing of this system was undertaken between July and September 2013.

Compliance with the Commonwealth Authorities and Companies (CAC) Act 1997

A report indicating CAC Act compliance and financial sustainability for the 2012–2013 financial year was approved by the Board on 29 August 2012 and forwarded to the Department of Finance and Administration and the Department of Agriculture shortly after the Board Meeting, and approval granted. A similar document will be considered by the SRDC Board as part of their final duties following the closure of SRDC.

Risk management

The SRDC was committed to managing risk to continue to protect its:

- stakeholders
- employees and their skills
- environment
- quality of service
- assets and intellectual property
- contractual and statutory obligations
- corporate image and reputation.

The Board reviewed the Fraud Control Plan, Risk Management Plan and Business Continuity Plan via the Audit Committee annually. The SRDC complied with the policies of the Protective Security Manual, the Australian Government's Protective Security Framework and relevant Acts.

Protective security

In December 2011, SRDC was advised by the Secretary of the Australian Government Attorney-General's Department of changes to the Protective Security Policy Framework and the Australian Government Security Classification System. All existing protective security measures were reviewed by SRDC in 2012–2013 and measures implemented to address gaps in capability, where possible. In light of the industry proposal for changes to research structures, SRDC sought and received permission to defer implementation of some of the more expensive components of the Framework relating to information technology and capital works. With the approval for the establishment of SRA in June 2013 and the closure of SRDC, these activities were not progressed.

Intellectual property (IP) management

SRDC incorporated an Intellectual Property Management (IPM) Plan developed in consultation with major R&D providers into its application and project management system to ensure that intellectual property issues were considered fully during the development of project proposals and the management of approved projects.

Although formal ownership of intellectual property developed in most SRDC-funded R&D projects was usually vested in the research organisations, the Corporation retained an interest in capitalising on it and was a party to several patents and provisional patent applications. As part of the transfer of assets to SRA, ownership of any IP or IP interests held in the name of SRDC were transferred across.

Environment Protection and Biodiversity Conservation Act (EPBC Act)

The SRDC's obligations under section 516A of the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) required consideration of the environmental impacts of proposals and projects. Research project proponents were required to outline potential risks relating to the project, and appropriate management strategies and these were considered during assessment of proposals submitted for funding.

Potential and/or actual impacts of existing projects were also considered during the assessment of milestone reports and in project reviews. No proposals or projects with adverse environmental consequences were identified in the period July to September 2013. In accordance with the requirements of the EPBC Act SRDC reported to the Australian Government on how SRDC's actions accorded with the principles of ecologically sustainable development.

Privacy Commission

The SRDC complied with all obligations to the Privacy Commission in 2012–2013 and no additional issues were addressed in the period July to September 2013.

Freedom of Information (FOI)

The SRDC received no enquiries under the Freedom of Information (FOI) Act in the period July to September 2013.

Work Health and Safety (WH&S)

The SRDC's policy is to provide an environment that protects the health, safety and welfare of staff and visitors and actively encourages safe working practices, both in the office and in the field.

The Corporation's WH&S Management System sets out the policies and establishes procedures for planning, implementation, monitoring and review of WH&S matters. No health and safety issues required external reporting during the period July to September 2013. SRDC developed a Work from Home Policy to provide guidance for staff working from home in the event of being unable to access SRDC's tenancy. All SRDC Staff completed Comcover's online training course in February 2012.



North Queensland sugarcane grower Michael Waring is a Climate Champion for the Managing Climate Variability Program.

Section 5

Auditor's Report

Statement by the
Chairman, Executive
Director and Finance
Manager

Financial Statements
for the Period Ending
30 June 2013

Notes supporting
Financial Statements



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INDEPENDENT AUDITOR'S REPORT

To the Minister for Agriculture

I have audited the accompanying financial statements of the Sugar Research and Development Corporation for the period ended 30 September 2013, which comprise: a Statement by the Chairman and Executive Director; the Statement of Comprehensive Income; Balance Sheet; Statement of Changes in Equity; Cash Flow Statement; Schedule of Commitments; and Notes comprising a Summary of Significant Accounting Policies and other explanatory information.

Directors' Responsibility for the Financial Statements

The directors of the Sugar Research and Development Corporation are responsible for the preparation of the financial statements that give a true and fair view in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including the Australian Accounting Standards, and for such internal control as is necessary to enable the preparation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on the financial statements based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These Auditing Standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Sugar Research and Development Corporation's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Sugar Research and Development Corporation's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the directors, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting my audit, I have complied with the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

Opinion

In my opinion the financial statements of the Sugar Research and Development Corporation:

- (i) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including the Australian Accounting Standards; and
- (ii) give a true and fair view of the matters required by the Finance Minister's Orders including the Sugar Research and Development Corporation's financial position as at 30 September 2013 and of its performance and cash flows for the period then ended.

Emphasis of Matter

I draw attention to Notes 1.2 and 2 of the financial statements which indicate that the Sugar Research and Development Corporation has been wound up effective 30 September 2013, and state the basis on which the financial statements have been prepared. My opinion, set out above, has not been modified in respect of this matter.

Australian National Audit Office



Ron Wah
Audit Principal

Delegate of the Auditor-General

Canberra
31 January 2014

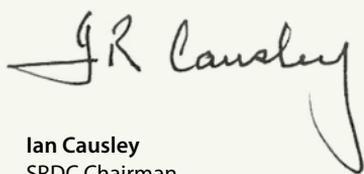
Sugar Research and Development Corporation

STATEMENT BY THE CHAIRMAN AND EXECUTIVE DIRECTOR

In our opinion, the attached financial statements for the period ended 30 September 2013 are based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the Commonwealth Authorities and Companies Act 1997, as amended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Authority has paid all outstanding debts.

This statement is made in accordance with a resolution of the directors.



Ian Causley
SRDC Chairman
31 January 2014



Annette Sugden
Executive Director
31 January 2014



Neil McKenzie from the University of Queensland is the winner of the 2013 SRDC Research Technician Award. Pictured with Floren Plaza at the Gas Anti Solvent Pilot Plant.

STATEMENT OF COMPREHENSIVE INCOME

for the period ended 30 September 2013

	<i>Notes</i>	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
EXPENSES			
Employee benefits	3A	299	1,613
Supplier	3B	368	840
Grants	3C	261	7,757
Depreciation and amortisation	3D	2	22
Write-down and impairment of assets	3E	–	2
Payments to Sugar Research Australia	3F	7,912	–
Total expenses		8,842	10,234
<i>LESS:</i>			
OWN-SOURCE INCOME			
Own-source revenue			
Industry contributions (sugar levies)	1.5	18	4,341
Interest	4A	60	563
Rental income	4B	–	6
Other revenue	4C	39	4
Total own-source revenue		117	4,914
Net cost of (contribution by) services		8,725	5,320
Revenue from Government	4D	–	4,341
Surplus (Deficit)		(8,725)	(979)
OTHER COMPREHENSIVE INCOME			
Total comprehensive (loss) attributable to the Australian Government*		(8,725)	(979)

The above statement should be read in conjunction with the accompanying notes.

BALANCE SHEET
as at 30 September 2013

	<i>Notes</i>	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
ASSETS			
Financial Assets			
Cash and cash equivalents	5A	1,541	9,982
Trade and other receivables	5B	–	1,096
Total financial assets		1,541	11,078
Non-Financial Assets			
Leasehold improvements	6A,C	–	–
Property, plant and equipment	6B,C	–	12
Other non-financial assets	6D	–	68
Total non-financial assets		–	80
Total assets		1,541	11,158
LIABILITIES			
Payables			
Suppliers	7A	–	(40)
Grants	7B	–	(6)
Other payables	7C	–	(30)
Total payables		–	(76)
Provisions			
Employee provisions	8A	–	(752)
Other provisions	8B	–	(64)
Total provisions		–	(816)
Total liabilities		–	(892)
Net assets		1,541	10,266
EQUITY			
Parent Entity Interest			
Retained surplus (accumulated deficit)		1,541	10,266
Total parent entity interest		1,541	10,266
Total equity		1,541	10,266

The above statement should be read in conjunction with the accompanying notes.

STATEMENT OF CHANGES IN EQUITY
for the period ended 30 September 2013

	Retained earnings		Total equity	
	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
Opening balance				
Balance carried forward from previous period	10,266	11,245	10,266	11,245
Comprehensive income				
Other comprehensive income	–	–	–	–
Surplus (Deficit) for the period	(8,725)	(979)	(8,725)	(979)
Total comprehensive income	(8,725)	(979)	(8,725)	(979)
Closing balance as at 30 June	1,541	10,266	1,541	10,266

The above statement should be read in conjunction with the accompanying notes.

CASH FLOW STATEMENT
for the period ended 30 September 2013

	<i>Notes</i>	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
OPERATING ACTIVITIES			
Cash received			
Industry contributions (sugar levies)		188	4,195
Receipts from Government		–	3,817
Interest		129	552
Net GST received		214	670
Other		39	35
Total cash received		570	9,269
Cash used			
Employees		(979)	(1,053)
Suppliers		(458)	(904)
Grants		(294)	(8,508)
Other – Payments made to Sugar Research Australia		(7,280)	–
Total cash used		(9,011)	(10,465)
Net cash from (used by) operating activities	9	(8,441)	(1,196)
INVESTING ACTIVITIES			
Cash used			
Purchase of leasehold improvements, plant and equipment		–	(8)
Total cash used		–	(8)
Net cash from (used by) investing activities		–	(8)
Net increase (decrease) in cash held		(8,441)	(1,204)
Cash and cash equivalents at the beginning of the reporting period		9,982	11,186
Effect of exchange rate movements on cash and cash equivalents at the beginning of the reporting period		–	–
Cash and cash equivalents at the end of the reporting period	5A	1,541	9,982

The above statement should be read in conjunction with the accompanying notes.

SCHEDULE OF COMMITMENTS

as at 30 September 2013

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
BY TYPE		
Commitments receivable		
Net GST recoverable on commitments ¹	–	31
Total commitments receivable	–	31
Commitments payable		
Other commitments		
Operating leases ²	–	(55)
Research and development grants – PIERD	–	(287)
Total other commitments	–	(342)
Net commitments by type	–	(311)
BY MATURITY		
Commitments receivable		
Other commitments receivable		
One year or less	–	31
Total other commitments receivable	–	31
Commitments payable		
Operating lease commitments		
One year or less	–	(55)
Total operating lease commitments	–	(55)
Other Commitments		
One year or less	–	(287)
From one to five years	–	–
Total other commitments	–	(287)
Total commitments payable	–	(342)
Net commitments by maturity	–	(311)

Note:

1. Commitments were GST inclusive where relevant.
2. Operating leases included were effectively non-cancellable and comprise:

Leases for office accommodation

The Corporation's current lease expired in September 2013 and the premises were vacated.

Note 1: Summary of Significant Accounting Policies

1.1 Objectives of the Entity

The Sugar Research and Development Corporation (the Corporation) was an Australian Government controlled entity funded by statutory levies and government contributions. The objective of the Corporation was 'to foster an innovative and sustainable Australian sugar industry through targeted investment in research and development'. The Corporation's corporate outcome expressed the overall goal of 'a profitable and internationally competitive and sustainable Australian sugar industry providing economic, environmental and social benefits for rural and regional communities through targeted investment in research and development'.

The Sugar Research and Development Services Act 2013 and the Sugar Research and Development Services (Consequential Amendments and Transitional Provisions) Act 2013 (the Acts) received Royal Assent on 29 June 2013. The Acts implement new sugar research and development arrangements. They recognise an "industry services body" to which the assets, liabilities and project related activities of the Corporation were transferred by 30 September with any remaining cash being transferred on 1 October 2013. They also included transitional provisions to wind up the Corporation by repealing the Sugar Research and Development Corporation Regulations 1990 (which established the Corporation) with effect from 1 October 2013.

1.2 Basis of Preparation of the Financial Statements

The financial statements are general purpose financial statements and are required by clause 1(b) of Schedule 1 to the Commonwealth Authorities and Companies Act 1997.

The financial statements have been prepared in accordance with:

- a) Finance Minister's Orders (FMOs) for reporting periods ending on or after 1 July 2011; and
- b) Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

As stated in note 1.1, legislation was passed through parliament on 28 June 2013 and received royal assent on 29 June 2013, which made the Corporation not a going concern from this date. The Corporation ceased to exist on 1 October 2013 in accordance with this legislation. The assets, liabilities and project related activities of the Corporation were transferred to an industry owned company. The preparation of the financial statements reflects the windup of operations, disposal of assets (including cash) and settlement of all outstanding liabilities, employee entitlements and provisions. Note 2 provides additional disclosure in respect of the disposal of assets and settlement of liabilities.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Unless an alternative treatment is specifically required by an accounting standard or the FMOs, assets and liabilities are recognised in the balance sheet when and only when it is probable that future economic benefits will flow to the entity or a future sacrifice of economic benefits will be required and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under executory contracts are not recognised unless required by an accounting standard. Liabilities and assets that are unrecognised are reported in the schedule of commitments or the schedule of contingencies.

NOTES OF THE FINANCIAL STATEMENTS

Unless alternative treatment is specifically required by an accounting standard, income and expenses are recognised in the Statement of Comprehensive Income when and only when the flow, consumption or loss of economic benefits has occurred and can be reliably measured.

1.3 Significant Accounting Judgements and Estimates

Estimates and judgements are continually evaluated and are based on historical experience and other factors, including expectations of future events that may have a financial impact on the Corporation and that are believed to be reasonable under the circumstances.

Make good provision on office lease

A condition of the lease over the office premises is that the space occupied by the Corporation will be returned to its original condition at the end of the lease period. The lease agreement specifies the conditions that must be met. This was completed after the end of the lease period. A provision for make good and reparation after the closure of the Corporation was included in the accounts as a prepayment

1.4 New Australian Accounting Standards

Adoption of New Australian Accounting Standard Requirements

No accounting standard has been adopted earlier than the application date as stated in the standard.

Other new standards/revised standards/interpretations/amending standards that were issued prior to the signing of statement by the Director and Executive Director and are applicable to the current reporting period did not have a financial impact on the Corporation.

Future Australian Accounting Standard Requirements

No future accounting standards are applicable due to the closure on 1 October 2013.

1.5 Revenue

Revenue from Government

Revenue was predominantly derived from levies collected from the sugar industry with matching Commonwealth Contributions in accordance with the *Primary Industries and Energy Research and Development Act 1989* (PIERD).

Funding received or receivable from the Department of Agriculture, Fisheries and Forestry (appropriated to the Corporation as a CAC Act body payment item for payment to the Corporation) was recognised as Revenue from Government unless in the nature of an equity injection or loan.

Commonwealth Contributions revenue was recognised based on a percentage of monthly expenditure incurred by the Corporation, subject to a cap of 0.5 percent of the Gross Value of Production.

No Commonwealth funding was received from the Government for the period from 1 July 2013 until closure of the Corporation. A final industry levy was received on 24 July 2013; this amount of \$18,434.55 was for the period 1 July 2013 to 17 July 2013. The Corporation was still legislated to receive industry levies in accordance with the *Primary Industries (Excise) Levies Act 1999* and the *Primary Industries Levies and Charges Collections Act 1991* until the signing of the *Statutory Funding Agreement 2013–2017* between the Commonwealth and Sugar Research Australia Ltd on 5 August 2013.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

- a) the amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and
- b) the probable economic benefits associated with the transaction will flow to the entity.

Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment allowance account. Collectability of debts is reviewed at end of the reporting period. Allowances are made when collectability of the debt is no longer probable.

Interest revenue is recognised using the effective interest method as set out in AASB 139 Financial Instruments: Recognition and Measurement.

1.6 Gains

Sale of Assets

Gains from disposal of assets are recognised when control of the asset has passed to the buyer.

1.7 Transactions with the Government as Owner

Equity Injections

Amounts appropriated which are designated as 'equity injections' for a year (less any formal reductions) and Departmental Capital Budgets (DCBs) are recognised directly in contributed equity in that year.

1.8 Employee Benefits

Liabilities for 'short-term employee benefits' (as defined in AASB 119 Employee Benefits) and termination benefits expected to be settled wholly before twelve months after the end of the annual reporting period are measured at their nominal amount.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability.

Other long-term employee benefits are measured as net total of the present value of the defined benefit obligation at the end of the reporting period minus the fair value at the end of the reporting period of plan assets (if any) out of which the obligations are to be settled directly.

Leave

The liability for employee benefits includes provision for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees of the entity is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will be applied at the time the leave is taken, including the entity's employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability for long service leave has been determined by reference to the work of an actuary as at 30 June 2013. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Leave liabilities provided for as at 30 June 2013 have been fully paid and no outstanding liabilities exists as at 30 September 2013.

NOTES OF THE FINANCIAL STATEMENTS

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. The entity recognises a provision for termination when it has developed a detailed formal plan for the terminations and has informed those employees affected that it will carry out the terminations.

Superannuation

The entity's staff are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), the PSS accumulation plan (PSSap) or other retail superannuation plans.

The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported in the Department of Finance and Deregulation's administered schedules and notes.

The entity makes employer contributions to the employees' superannuation scheme at rates determined by an actuary to be sufficient to meet the current cost to the Government. The entity accounts for the contributions as if they were contributions to defined contribution plans.

The liability for superannuation recognised as at 30 September represents outstanding contributions for the final fortnight of the year.

1.9 Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains substantially all such risks and benefits.

Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

The Corporation has no finance leases.

1.10 Grants

Most grant agreements required the grantee to perform services, provide facilities or meet eligibility criteria. In these cases, the Corporation recognises grant liabilities only to extent that the services required have been performed or the eligible criteria have been satisfied by the grantee.

In cases where grant agreements are made without conditions to be monitored, liabilities are recognised on signing the agreement.

Grant expenses are recognised when a milestone is approved.

1.11 Cash

Cash is recognised at its nominal amount. Cash and cash equivalents includes:

- a) cash on hand; and
- b) deposits in bank accounts with an original maturity of 6 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value.

1.12 Financial Assets

The entity classifies its financial assets in the following categories:

- a) held-to-maturity investments;
- b) loans and receivables.

The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset, or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis.

Held-to-Maturity Investments

Non-derivative financial assets with fixed or determinable payments and fixed maturity dates that the group has the positive intent and ability to hold to maturity are classified as held-to-maturity investments. Held-to-maturity investments are recorded at amortised cost using the effective interest method less impairment, with revenue recognised on an effective yield basis.

Loans and Receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period.

Financial assets carried at amortised cost – if there is objective evidence that an impairment loss has been incurred for loans and receivables or held to maturity investments held at amortised cost, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

1.13 Investments in Associates

The entity's investment in its associates is accounted for using the equity method.

Under the equity method, investments in the associates are carried in the entity's balance sheet at cost as adjusted for post-acquisition changes in the entity's share of net assets of the associates. Goodwill relating to an associate is included in the carrying amount of the investment. After the application of the equity method, the entity determines whether it is necessary to recognise any impairment loss with respect to the net investment in associates.

The Corporation holds no investments in associates.

NOTES OF THE FINANCIAL STATEMENTS

1.14 Financial Liabilities

Financial liabilities are classified as either financial liabilities 'at fair value through profit or loss' or other financial liabilities. Financial liabilities are recognised and derecognised upon 'trade date'.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

The Corporation hold no financial liabilities.

1.15 Contingent Liabilities and Contingent Assets

Contingent liabilities and contingent assets are not recognised in the balance sheet but are reported in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset or represent an asset or liability in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

1.16 Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost, or for nominal consideration, are initially recognised as assets and income at their fair value at the date of acquisition, unless acquired as a consequence of restructuring of administrative arrangements. In the latter case, assets are initially recognised as contributions by owners at the amounts at which they were recognised in the transferor's accounts immediately prior to the restructuring.

No assets were acquired by the Corporation from 1 July 2013 to 30 September 2013.

1.17 Leasehold Improvements, Plant and Equipment

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the balance sheet, except for purchases costing less than \$2,000 which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

Assets which have a book value of \$2,000 or less at the start of the income year are removed from the asset register and expensed.

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and restoring the site on which it is located. This is particularly relevant to 'make good' provisions in property leases taken up by the entity where there exists an obligation to restore the property to its original condition. These costs are included in the value of the entity's leasehold improvements with a corresponding provision for the 'make good' recognised.

Revaluations

Fair values for each class of asset are determined as shown below:

<i>Asset class</i>	<i>Fair value measurement</i>
Leasehold improvements	Depreciated replacement cost
Plant and equipment	Market selling price

Following initial recognition at cost, property, plant and equipment were carried at fair value less subsequent accumulated depreciation and accumulated impairment losses. Valuations were conducted with sufficient frequency to ensure that the carrying amounts of assets did not differ materially from the assets' fair values as at the reporting date. The regularity of independent valuations depended upon the volatility of movements in market values for the relevant assets.

Revaluation adjustments were made on a class basis. Any revaluation increment was credited to equity under the heading of asset revaluation reserve except to the extent that it reversed a previous revaluation decrement of the same asset class that was previously recognised in the surplus/deficit. Revaluation decrements for a class of assets were recognised directly in the surplus/deficit except to the extent that they reversed a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date was eliminated against the gross carrying amount of the asset and the asset was restated to the revalued amount.

Depreciation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives to the entity using, in all cases, the straight-line method of depreciation.

Depreciation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

	2013	2012
Leasehold improvements	Lease term	Lease term
Plant and equipment	3 years	3 to 7 years

All heritage and cultural assets have indefinite useful lives and are not depreciated.

NOTES OF THE FINANCIAL STATEMENTS

Impairment

All assets were assessed for impairment at 30 September 2013. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

All assets were disposed of and derecognised by 30 September 2013.

1.18 Taxation

The Corporation is exempt from all forms of taxation except Fringe Benefits Tax (FBT) and the Goods and Services Tax (GST).

Revenues, expenses and assets are recognised net of GST except:

- a) where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- b) for receivables and payables.

1.19 Comparative information

This final annual report for the Corporation is reporting the activities for the period 1 July 2013 to 30 September 2013.

The comparative period used in the financial statements is for the full 12 month period from 1 July 2012 to 30 June 2013.

1.20 Payment to Sugar Research Australia (SRA)

As stated in Note 1.1, 1.2 and 2, due to the closure of the Corporation as instructed by the passing of legislations and the Statutory Funding Agreement, all available balances except for the bank account balance as at 30 September 2013 are transferred to SRA from the Corporation's books and is recorded as an expense in the Statement of Comprehensive Income.

Note 2: Wind-up of Sugar Research and Development Corporation

The Sugar Research and Development Corporation ceased to exist as of 1 October 2013.

The following legislation supported the formation of an industry owned corporation called Sugar Research Australia (SRA). This legislation was passed through parliament on 28 June 2013 and received royal assent on 29 June 2013.

- Sugar Research and Development Services Act 2013
- Sugar Research and Development Services (Consequential Amendments and Transitional Provisions) Act 2013
- Sugar Research and Development Services (Consequential Amendments – Excise) Act 2013

This legislation is supported by a Statutory Funding Agreement which was signed on 5 August 2013.

The majority of the cash assets of the Corporation were transferred to Sugar Research Australia during the period 1 July 2013 to 30 September 2013. The total cash transferred during this period was \$7,279,858.

On 1 October 2013, the Corporation's bank account was closed and the final balance of \$1,540,793 was transferred to Sugar Research Australia.

Property, plant and equipment with a written down value of \$9,163 was transferred to Sugar Research Australia.

On 30 September 2013 the Corporation had an outstanding receivable of \$634,883. This was for a Commonwealth Matching Research and Development Contributions claim under the Primary Industries and Energy Development Act 1989. This receivable was transferred to Sugar Research Australia.

The make good provision balance of \$64,423 acknowledged the Corporation's obligation to make good the premises at the end of the lease. This obligation was met prior to 30 September 2013.

On 30 September 2013, the creditors balance of \$9,200 was transferred to Sugar Research Australia. No invoice for this balance was received prior to the closure of the bank accounts. All invoices received after 30 September 2013 were forwarded to Sugar Research Australia for payment.

The Corporation at 30 September 2013 had fully satisfied the remuneration entitlements of all employees and directors. No employee entitlement liabilities were transferred to Sugar Research Australia.

The Corporation incurred no leave or redundancy expenses for the period 1 July 2013 to 30 September 2013. Provisions for leave and redundancies were recorded at 30 June 2013 for the payment of these balances to employees and directors. Payments made after 30 June 2013 were recorded against the provisions raised.

NOTES OF THE FINANCIAL STATEMENTS

July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 3: Expenses

Note 3A: Employee Benefits

Wages and salaries	218	830
Superannuation:		
Defined contribution plans	18	81
Defined benefit plans	14	58
Leave and other entitlements	–	(63)
Other employee expenses	49	246
Separation and redundancies	–	461
Total employee benefits	299	1,613

Note 3B: Supplier

Goods and services

Consultants and Contractors	60	103
Communication	55	29
Audit fees	16	16
Sponsorships	–	–
Other	177	452
Total goods and services	308	600

Goods and services are made up of:

Provision of goods – external parties	60	103
Rendering of services – external parties	248	497
Total goods and services	308	600

Other supplier expenses

Operating lease rentals – external parties:		
Minimum lease payments	60	240
Total other supplier expenses	60	240
Total supplier expenses	368	840

NOTES OF THE FINANCIAL STATEMENTS

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 3C: Grants

Public sector:

Research and development grants – PIERD	261	7,757
Total grants	261	7,757

Note 3D: Depreciation and Amortisation

Depreciation:

Plant and Equipment	2	6
Leasehold Improvements	–	16
Total depreciation	2	22

Note 3E: Write-Down and Impairment of Assets

Asset write-downs and impairments from:

Write down of plant and equipment	–	2
Total write-down and impairment of assets	–	2

Note 3F: Payments/transfers to Sugar Research Australia

Cash paid to Sugar Research Australia	7,280	–
Property, plant and equipment transferred	10	–
Revenue from Government to be received by Sugar Research Australia	634	–
Expenses to be paid by Sugar Research Australia	(25)	–
Refund from the Australian Taxation Office to be received by Sugar Research Australia	13	–
Total payments to Sugar Research Australia	7,912	–

NOTES OF THE FINANCIAL STATEMENTS

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 4: Income

OWN-SOURCE REVENUE

Note 4A: Interest

Cash at Bank	16	19
Deposits	44	544
Total interest	60	563

Note 4B: Rental Income

Rental income from sublease	–	6
Total rental income	–	6

Note 4C: Other Revenue

Royalties	–	3
Other	39	1
Total other revenue	39	4

	2013 \$'000	2012 \$'000
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REVENUE FROM GOVERNMENT

Note 4D: Revenue from Government

Commonwealth Contribution – PIERD ACT	–	4,341
Total revenue from Government	–	4,341

NOTES OF THE FINANCIAL STATEMENTS

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 5: Financial Assets

Note 5A: Cash and Cash Equivalents

Cash on hand or on deposit	1,541	9,982
Total cash and cash equivalents	1,541	9,982

Note 5B: Trade and Other Receivables

Goods and Services:

Goods and services – external parties	–	–
Total receivables for goods and services	–	–

Department of Agriculture, Fisheries and Forestry:

Commonwealth Contribution receivable	–	635
Levies receivable	–	170
Total receivable from Department of Agriculture, Fisheries and Forestry	–	805

Other receivables:

GST receivable from the Australian Taxation Office	–	220
FBT receivable from the Australian Taxation Office	–	1
Interest	–	70
Total other receivables	–	291
Total trade and other receivables (gross)	–	1,096

Receivables are expected to be recovered in:

No more than 12 months	–	1,096
Total trade and other receivables (net)	–	1,096

Receivables are aged as follows:

Not overdue	–	1,096
Total receivables (gross)	–	1,096

NOTES OF THE FINANCIAL STATEMENTS

July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 5C: Investments in Associate Company

Sacron Innovations Pty Ltd was incorporated to take up the residual assets from CRCSIIB which was wound up on 30 June 2010.

The Corporation's share of the company was 33.07%. An amount of \$38,674 was received by the Corporation on the winding up of Sacron Innovations Pty Ltd on 6 September 2013. This amount has been recognised as income in Note 4C.

Note 6: Non-Financial Assets

Note 6A: Leasehold Improvements

Leasehold improvements:

Fair value	–	158
Accumulated depreciation	–	(158)
Total leasehold improvements	–	–

Note 6B: Plant and Equipment

Other property, plant and equipment:

Fair value	–	21
Accumulated depreciation	–	(9)
Total other property, plant and equipment	–	12

All revaluations are conducted in accordance with the revaluation policy stated in Note 1.

All property, plant and equipment was disposed of by the Corporation on 30 September 2013.

No indicators of impairment were found for property, plant and equipment.

NOTES OF THE FINANCIAL STATEMENTS

	Leasehold improvements \$'000	Plant & equipment \$'000	Total \$'000
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Note 6C: Reconciliation of the Opening and Closing Balances of Property, Plant and Equipment

As at 1 July 2013

Gross book value	158	21	179
Accumulated depreciation and impairment	(158)	(9)	(167)
Net book value 1 July 2013	–	12	12
Additions:			
By purchase	–	–	–
Depreciation expense	–	(2)	(2)
Disposals:			
Other	–	(10)	(10)
Net book value 30 September 2013	–	–	–
Net book value as of 30 September 2013 represented by:			
Gross book value	–	–	–
Accumulated depreciation and impairment	–	–	–
Net book value 30 September 2013	–	–	–

As at 1 July 2012

Gross book value	158	45	203
Accumulated depreciation and impairment	(142)	(33)	(175)
Net book value 1 July 2012	16	12	28
Additions:			
By purchase	–	8	8
Depreciation expense	(16)	(6)	(22)
Disposals:			
Other	–	(2)	(2)
Net book value 30 June 2013	–	12	12
Net book value as of 30 June 2013 represented by:			
Gross book value	158	21	179
Accumulated depreciation and impairment	(158)	(9)	(167)
Net book value 30 June 2013	–	12	12

NOTES OF THE FINANCIAL STATEMENTS

	Leasehold improvements \$'000	Plant & equipment \$'000	Total \$'000
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Note 6D: Other Non-Financial Assets

Prepayments	-	68	
Total other non-financial assets	-	68	

Total other non-financial assets – are expected to be recovered in:

No more than 12 months	-	68	
Total other non-financial assets	-	68	

No indicators of impairment were found for other non-financial assets.

NOTES OF THE FINANCIAL STATEMENTS

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 7: Payables

Note 7A: Suppliers

Trade creditors and accruals	-	(40)
Total suppliers payables	-	(40)

Suppliers payables expected to be settled within 12 months:

External parties	-	(40)
Total	-	(40)

Note 7B: Grants

Private sector:

Other	-	(6)
Total grants	-	(6)

Total grants – are expected to be settled in:

No more than 12 months	-	(6)
Total grants	-	(6)

Note 7C: Other Payables

Other	-	(30)
Total other payables	-	(30)

Total other payables are expected to be settled in:

No more than 12 months	-	(30)
Total other payables	-	(30)

NOTES OF THE FINANCIAL STATEMENTS

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 8: Provisions

Note 8A: Employee Provisions

Leave	–	(290)
Separations and redundancies	–	(462)
Total employee provisions	–	(752)
Employee provisions are expected to be settled in:		
No more than 12 months	–	(752)
More than 12 months	–	–
Total employee provisions	–	(752)

Note 8B: Other Provisions

Make Good provision	–	(64)
Total other provisions	–	(64)
Other provisions are expected to be settled in:		
No more than 12 months	–	(64)
Total other provisions	–	–

		Make Good Provision \$'000
Carrying amount 1 July 2013		(64)
Additional provisions made		(27)
Amounts used		84
Amounts reversed		7
Unwinding of discount or change in discount rate		–
Closing balance 30 September 2013		–

The Corporation had an agreement in place for the leasing of premises which has provisions requiring the entity to restore the premises to their original condition at the conclusion of the lease. The Corporation made a provision to reflect the present value of this obligation and the make good provision was cleared in the period to 30 September 2013 as the premises were vacated upon the closure of the Corporation.

NOTES OF THE FINANCIAL STATEMENTS

	2013 \$'000	2012 \$'000
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Note 9: Cash Flow Reconciliation

Reconciliation of cash and cash equivalents as per Balance Sheet to Cash Flow Statement

Cash and cash equivalents as per:

Cash flow statement	1,541	9,982
Balance sheet	1,541	9,982
Difference	-	-

Reconciliation of net cost of services to net cash from operating activities:

Net cost of services	(8,725)	(5,320)
Add revenue from Government	-	4,341

Adjustments for non-cash items

Depreciation / amortisation	2	22
Net write down of non-financial assets	-	2
Transfer of property, plant and equipment	10	-

Changes in assets / liabilities

(Increase) / decrease in net receivables	1,096	(596)
(Increase) / decrease in prepayments	68	(47)
Increase / (decrease) in employee provisions	(752)	399
Increase / (decrease) in supplier payables	(40)	4
Increase / (decrease) in other payable	(30)	(13)
Increase / (decrease) in other provisions	(64)	6
Increase / (decrease) in grants payable	(6)	6
Net cash from (used by) operating activities	(8,441)	(1,196)

NOTES OF THE FINANCIAL STATEMENTS

July 2013 –
Sept 2013
No.

July 2012 –
June 2013
No.

Note 10: Contingent Assets and Liabilities

Quantifiable Contingencies

At 30 September 2013, the Corporation had no quantifiable contingencies.

Unquantifiable Contingencies

At 30 September 2013, the Corporation had no unquantifiable contingencies.

Significant Remote Contingencies

At 30 September 2013, the Corporation had no significant remote contingencies.

Note 11: Directors Remuneration

The number of non-executive directors of the entity included in these figures are shown below in the relevant remuneration bands:

\$0 to \$29,999	6	5
\$30,000 to \$59,999	–	2
Total	6	7
	\$	\$
Total remuneration received or due and receivable by directors of the entity	58,030	195,671

Part-time directors and the Chairman of the Corporation received fees and allowances as determined by the Remuneration Tribunal. Remuneration includes salary, allowances and superannuation.

The Board remained in their role until the Annual Report and Financial Statements were approved.

The Executive Director was the only full-time director of the Corporation and received a salary and allowances as approved by the Board which is disclosed in Note 13.

Note 12: Related Party Disclosures

There were no transactions, grants or relationships to directors of any related parties (2012–2013: Nil)

NOTES OF THE FINANCIAL STATEMENTS

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 13: Senior Executive Remuneration

Note 13A: Senior Executive Remuneration Expenses for the Reporting Period

Short-term employee benefits:		
Salary	(48,529)	(175,202)
Annual leave accrued ³	(3,735)	(13,486)
Total short-term employee benefits	(52,264)	(188,688)
Post-employment benefits:		
Superannuation	(9,132)	(33,775)
Total post-employment benefits	(9,132)	(33,775)
Other long-term employee benefits:		
Long-service leave ³	(1,213)	(4,380)
Total other long-term employee benefits	(1,213)	(4,380)
Termination benefits:		
Involuntary redundancy payments	–	(90,125)
Total termination benefits	–	(90,125)
Total senior executive remuneration expenses	(62,610)	(316,968)

- Note 13A is prepared on an accrual basis.
- The remuneration package for the Executive Director does not include provision for performance bonuses or increments.
- The accrual shown for annual and long service leave for the period 1 July 2013 to 30 September 2013 was expensed in the prior year. These amounts are included in the leave provision for the prior year as disclosed in Note 8. Note 2 includes further disclosures on the payment of employee benefits during the wind up of the Corporation.

NOTES OF THE FINANCIAL STATEMENTS

Note 13B: Average Annual Reportable Remuneration Paid to Substantive Senior Executives during the Reporting Period

Average annual reportable remuneration paid to substantive senior executives in 2014

Average annual reportable remuneration ¹	Substantive senior executives No.	Reportable salary ² \$	Contributed superannuation ³ \$	Total reportable remuneration \$
Total reportable remuneration (including part-time arrangements):				
Less than \$180,000	1	48,529	9,132	57,661
Total number of substantive senior executives	1			

Average annual reportable remuneration paid to substantive senior executives in 2013

Average annual reportable remuneration ¹	Substantive senior executives No.	Reportable salary ² \$	Contributed superannuation ³ \$	Total reportable remuneration \$
Total reportable remuneration (including part-time arrangements):				
\$180,000 to \$209,999	1	175,202	33,775	208,977
Total number of substantive senior executives	1			

- This table reports substantive senior executives who received remuneration during the reporting period. Each row is an averaged figure based on headcount for individuals in the band.
- 'Reportable salary' includes the following:
 - gross payments (less any bonuses paid, which are separated out and disclosed in the 'bonus paid' column);
 - reportable fringe benefits (at the net amount prior to 'grossing up' for tax purposes);
 - exempt foreign employment income; and
 - salary sacrificed benefits.
- The 'contributed superannuation' amount is the average cost to the entity for the provision of superannuation benefits to substantive senior executives in that reportable remuneration band during the reporting period, including any salary sacrificed amounts, as per the individuals' payslips.

NOTES OF THE FINANCIAL STATEMENTS

Note 13C: Average Annual Reportable Remuneration Paid to Other Highly Paid Staff during the Reporting Period

During the reporting period, there were no other employees whose salary was \$180,000 or more.

Note 14: Remuneration of Auditors

	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
Fair value of the services provided		
Financial statement audit services	16	16
Total	16	16

Financial statement audit services were provided by the Australian National Audit Office.

No other services were provided by the auditors of the financial statements.

NOTES OF THE FINANCIAL STATEMENTS

July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
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Note 15: Financial Instruments

Note 15A: Categories of Financial Instruments

Financial Assets		
Loans and receivables:		
Cash at bank or on deposit	1,541	9,982
Interest receivable	–	70
Total	1,541	10,052
Carrying amount of financial assets	1,541	10,052
Financial Liabilities		
At amortised cost:		
Trade creditors	–	(40)
Grants payable	–	(6)
Total	–	(46)
Carrying amount of financial liabilities	–	(46)

Note 15B: Net Income and Expense from Financial Assets

Loans and receivables		
Interest revenue	60	563
Net gain/(loss) from loans and receivables	60	563
Net gain/(loss) from financial assets	60	563

Note 15C: Fair Value of Financial Instruments

The fair value of the assets and liabilities are reflected by the carrying amount shown in the Statement of Financial Position.

Note 15D: Credit Risk

The Corporation is exposed to minimal credit risk as the majority of loans and receivables are cash and appropriations made under law (which guarantees fixed amount of funding that the Corporation can draw down on as required) or owed by the Australian Taxation Office in the form of a Goods and Services Refund. The maximum exposure to credit risk is the risk that arises from the potential default of a debtor. This amount is equal to the total amount of trade receivables (2014: \$nil and 2013: \$nil). The Corporation has assessed that there is no risk of default and has not recognised an impairment account.

The Corporation holds no collateral to mitigate against credit risk.

Credit quality of financial instruments not past due or individually determined as impaired

	Not past due nor impaired July 2013 – Sept 2013 \$'000	Not past due nor impaired July 2012 – June 2013 \$'000	Past due or impaired July 2013 – Sept 2013 \$'000	Past due or impaired July 2012 – June 2013 \$'000
Cash at bank or on deposit	1,541	9,982	–	–
Interest receivable	–	70	–	–
Total	1,541	10,052	–	–

There were no financial assets that are past due or impairment.

NOTES OF THE FINANCIAL STATEMENTS

Note 15E: Liquidity Risk

The Corporation's financial liabilities are payables for goods and services. The exposure to liquidity risk is based on the notion that the Corporation will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to appropriation funding and mechanisms available to the Corporation and internal policies and procedures put in place to ensure there are appropriate resources to meet its financial obligations.

The Corporation is appropriated funding from the Australian Government. The Corporation manages its budgeted funds to ensure it has adequate funds to meet payments as they fall due. In addition, the Corporation has policies in place to ensure timely payments are made when due and has no past experience of default.

Maturities for non-derivative financial liabilities 2014

	On demand \$'000	within 1 year \$'000	1 to 2 years \$'000	2 to 5 years \$'000	> 5 years \$'000
Trade creditors	-	-	-	-	-
Grants payable	-	-	-	-	-
Total	-	-	-	-	-

Maturities for non-derivative financial liabilities 2013

	On demand \$'000	within 1 year \$'000	1 to 2 years \$'000	2 to 5 years \$'000	> 5 years \$'000
Trade creditors	-	(40)	-	-	-
Grants payable	-	(6)	-	-	-
Total	-	(40)	-	-	-

The Corporation has no derivative financial liabilities in either the current or prior year.

Note 15F: Market Risk

The Corporation holds basic financial instruments that do not expose the Corporation to certain market risks. The Corporation is not exposed to 'currency risk' or 'other price risks'.

The Corporation's only exposure to interest rate risk is through credit cards. This risk is minimised by ensuring that the balance is paid monthly by the due date.

Note 16: Reporting of Outcomes

The Corporation's mission is 'to foster an innovative and sustainable Australian sugar industry through targeted investment in research, development and extension (RD&E)'.

The Corporation is structured to meet one outcome; 'A profitable and internationally competitive and sustainable Australian sugarcane industry providing economic, environmental and social benefits for rural and regional communities through targeted investments in research and development'.

Four Output Groups have been identified as contributing to the one corporate outcome.

- 1.1 Supporting a profitable and market-driven industry underpinned by advanced technology to produce a reliable and increasing supply of sugarcane. Investment will focus on aspects of crop production and management including: plant genetics, pest control, soil and plant interactions and harvesting ('Growing the Crop').
- 1.2 Supporting a profitable milling sector utilising new and improved technologies and processes. Areas targeted for investment include: mill capital use and operating efficiency, enhancing the value of existing products, transport efficiency and raw sugar quality ('Milling the Crop').
- 1.3 Coordinating, facilitating and extending, as appropriate, existing environmental stewardship programs. Investment will target: positioning the industry as a leader in environmental responsibility; waste minimisation and utilisation; and preparing for a global environment with different resource availability and values ('Sustaining the Environment').
- 1.4 Supporting an industry committed to a culture of education, learning and innovation. Investment will focus on: innovation skills; leadership and decision making skilling; business practice and value chain improvements; and extension and adoption of research ('Skills and Capability').

Note 16A: Net Cost of Outcome Delivery

	Outcome 1		Total	
	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
Departmental				
Expenses	(8,842)	(10,234)	(8,842)	(10,234)
Own-source income	117	4,914	117	4,914
Net cost/(contribution) of outcome delivery	(8,725)	(5,320)	(8,725)	(5,320)

NOTES OF THE FINANCIAL STATEMENTS

Note 16B: Major Classes of Departmental Expense, Income, Assets and Liabilities by Outcome

	Outcome 1 ¹		Total	
	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000	July 2013 – Sept 2013 \$'000	July 2012 – June 2013 \$'000
Expenses				
Employees	(299)	(1,613)	(299)	(1,613)
Suppliers	(368)	(840)	(368)	(840)
Grants	(261)	(7,757)	(261)	(7,757)
Depreciation	(2)	(22)	(2)	(22)
Payments to Sugar Research Australia	(7,912)	–	(7,912)	–
Other	–	(2)	–	–
Total	(8,842)	(10,234)	(8,842)	(10,232)
Income				
Income from Government	–	4,341	–	4,341
Interest	60	563	60	563
Industry Contributions (sugar levies)	18	4,341	18	4,341
Other	39	10	39	10
Total	117	9,255	117	9,255
Assets				
Cash and cash equivalents	1,541	9,982	1,541	9,982
Trade and other receivables	–	1,096	–	1,096
Leasehold improvements	–	–	–	–
Property, plant and equipment	–	12	–	12
Other	–	68	–	68
Total	1,541	11,158	1,541	11,158
Liabilities				
Suppliers	–	(40)	–	(40)
Grants	–	(6)	–	–
Employee provisions	–	(752)	–	(752)
Other	–	(94)	–	(94)
Total	–	(892)	–	(886)



ABC TV Landline Presenter Pip Courtney visits a diversified sugarcane and cocoa farm near Mossman, North Queensland.

Section 6

Appendices

- A All active SRDC projects 1 July to 30 September 2013
- B Organisational Identifiers in Project Codes
- C Abbreviations and Acronyms
- D Table of compliance with publishing guidelines and legislation



The single row sprayer unit consisting of a camera, computer with image analysis software and solenoid-activated spray nozzles, developed for cane growers. Research conducted by the National Centre for Engineering in Agriculture is boosting grower knowledge of Precision Agriculture by providing training and workshops.

Appendix A

All active SRDC projects 1 July 2013 to 30 September 2013

Program 1: Growing the crop				
Strategy: Plant genetics				
Project No	Title	Period	Research Contact	Organisation
BSS319*	Maximising the rate of parental improvement in the Australian sugarcane breeding program	Jul 08 – Mar 16	Xianming Wei	SRA
BSS334	More crop per drop II : developing water-efficient and drought tolerant sugarcane cultivars for irrigated and dryland farming – Stage II	Jul 10 – Dec 14	Prakash Lakshmanan	SRA
BSS343	Maximising genetic gain from family and within family selection	Jul 11 – May 16	Mike Cox	SRA
BSS344	New germplasm to develop more productive varieties with enhanced resistance to nematodes, Pachymetra root rot and smut	Jul 11 – May 16	Barry Croft	SRA
BSS351	Improving the accuracy of selection in sugarcane breeding trials through accounting for site variability	Jul 12 – May 17	Xianming Wei	SRA
CPI017	Developing sugarcane for production systems utilising total biomass	Jul 09 – Dec 13	Phillip Jackson	CPI
CPI019	Towards a complete genome sequence of sugarcane; generation of data and development of bioinformatic resources	Jul 10 – Jan 15	Karen Aitken	CPI
CPI024	Faster flowering – new opportunities for genetic improvement.	Jul 12 – Aug 15	Anne Rae	CPI
CPI025	Development and testing of a SNP marker platform in sugarcane	June 12 – Aug 15	Karen Aitken	CPI
CPI030	Applying the genome sequence for variety improvement: validation and implementation	Jul 13 – Aug 18	Karen Aitken	CPI
ICSB02	Australian support of the International Consortium for Sugarcane	Jan 11 – May 14	Peter Twine	ICSB
BSS358	Developing cytogenetic and molecular tools to improve selection for soil borne pathogen resistance in wild hybrids	Jul 13 – Jun 16	Dr Nathalie Piperidis	SRA
NSC022	Exploiting introgression for the development of productive and regionally adapted varieties for NSW	Jul 13 – Jun 20	R Parfitt	NSWSMC

APPENDICES

Appendix A (continued)

All active SRDC projects 1 July 2013 to 30 September 2013

Program 1: Growing the crop

Strategy: Pest control

Project No	Title	Period	Research Contact	Organisation
BSS325 (3)	SmutBuster II: accelerated breeding of smut-resistant varieties	Jul 12 – Jun 16	Mike Cox	SRA
BSS331	Preparing the Australian sugar industry for threats from exotic pests and diseases	Jul 09 – May 15	Robert Magarey	SRA
BSS342	Remote sensing to implement an effective pest management strategy for canegrubs	Jul 11 – Mar 15	Peter Samson	SRA
CPI026	Investigation of smut resistance mechanisms in sugarcane	Jul 12 – Aug 15	Karen Aitken	CPI
GGP056	A monitoring-based system to enhance canegrub control best management practice for Isis sugarcane growers	Feb 10 – Jul 13	Wayne Stanley	ISISPL
GGP066	Integrated Feral Pig Management for the Herbert cane area	Jun 12 – Jan 15	Ian Kemp	HCUPM
GGP070	The Mantis – developing an innovative, high flotation, affordable high rise spray unit	Mar 13 – Feb 14	Wayne Gattera	Gattera & Devaney
BSS356	Mass production of the Adelina disease to better manage greyback canegrubs	Jul 13 – Jun 16	Nader Sallam	SRA
BSS357	Innovative approaches to identifying the cause of chlorotic streak and new management strategies	Jul 13 – Jun 16	Barry Croft	SRA
BSS362	Solving the Yellow Canopy Syndrome (YCS)	Jun 13 – Jun 14	Bernard Schroeder	SRA
CES001	Rapid detection of ratoon stunting disease	Jul 13 – May 16	Amalia Berna	SRA

Program 1: Growing the crop				
<i>Strategy: Soil-plant interactions</i>				
Project No	Title	Period	Research Contact	Organisation
CSI001*	Strategies to manage soil-borne fungi and mitigate sugarcane yield decline	Jul 13 – Jun 16	Paul Harvey	CSI
DPI020	Management solutions to optimise performance of new farming systems in southern canelands	Jul 08 – Jul 13	Mike Bell	DAFFQ
DPI025	Developing remote sensing as an industry wide yield forecasting, nitrogen mapping and research aide	May 13 – Oct 16	Andrew Robson	DAFFQ
GGP053	Improvement of internal soil drainage and yield on heavy clay soils in the Herbert	Jan 10 – Dec 14	Vince Russo	LUMPSFG
GGP060	Developing a robust soybean industry in Central and Northern Queensland	Jun 11 – Dec 13	Greg Miller	HCPSL
GGP071	Strategies to limit the impact of nematode pressure on sugarcane productivity in the Isis	Jun 13 – May 15	Bruce Quinn	ISISPL
GGP072*	Ameliorating clay sub soils to improve crop yields	Jan 13 – Dec 14	Glen Grohn	DAG
NCA012	UV absorption as a tool for growers to benchmark humified organic carbon in soil	Jul 12 – Mar 14	Pam Pittaway	NCEA
UQ044	SaveN Cane: Developing selection tools for N – efficient sugarcane	Jul 09 – Dec 14	Susanne Schmidt	UQ
CPI028*	Accessing stress resistant sugarcane and research investment from China	Apr 13 – May 17	Phillip Jackson	CPI
CPI029*	Selecting for favourable plant x soil water interactions	Jul 13 – Jun 17	Phillip Jackson	CPI
GGP045	Developing extended fallow options for the Plane Creek district	Jan 09 – Jul 13	Robert Sluggett	PCSF (Plane Creek Sustainable Farmers Inc)
GGP068	Investigating the role of microbes, carbon in soil-plant interaction in Burdekin sugarcane soils	May 13 – Dec 15	Tom McShane	ADVBDK (Advanced Burdekin Collective Research Inc)
GGP069	Quantifying the effects of microbial additions to sugarcane soils on crop productivity	May 13 – May 16	Jayson Dowie	BACT (Biologically Active)

APPENDICES

Appendix A (continued)

All active SRDC projects 1 July 2013 to 30 September 2013

Program 2: Milling the crop

Strategy: Mill capital use and operating efficiency

Project No	Title	Period	Research Contact	Organisation
GGP063	Investigating renewable feedstock's (such as Hibiscus Canabinues – Kenaf and Crotalaria Juncea – Sunn Hemp) for co-generation at Mackay Sugar Limited	Jan 11 – Dec 13	Joe Muscat	MFP
QUT014	Recovery of sucrose Project 2	Jul 10 – Jun 13	Kameron Dunn	QUT
QUT032	Developing a new methodology for competency based training courses for shift supervisors in sugar factories	Nov 08 – Nov 13	Ross Broadfoot	QUT
QUT038	Implement supervisory/advisory control of pan and fugal stations	Jul 10 – Dec 14	Ross Broadfoot	QUT
QUT040	Advanced computer simulation of sugar factories – SysCAD	Jul 10 – Nov 13	Ross Broadfoot	QUT
QUT048	Evaluate Brazilian mud filtration technology to increase the profitability and environmental performance of Australian factories	Jul 11 – Aug 14	Hakan Bakir	QUT
QUT050	Improving the performance and specification of evaporator stations	Jul 11 – Aug 13	Ross Broadfoot	QUT
QUT054	Determine the optimum tube dimensions for Robert evaporators through experimental investigations and CFD modelling	Jul 12 – Sep 16	Ross Broadfoot	QUT
QUT059	A retrofit to a mill to reduce its operational and maintenance costs	Jun 13 – Aug 16	Dr Geoff Kent	QUT
QUT060	Reducing the maintenance costs of mill rolls	Jun 13 – Aug 17	Dr Geoff Kent	QUT

Program 2: Milling the crop*Strategy: Enhancing the value of existing products*

Project No	Title	Period	Research Contact	Organisation
QUT036	The production of biofuels and value added co-products from thermochemical processing of sugarcane bagasse	Jul 09 – May 14	Phil Hobson	QUT
QUT049	Biomass characterisation facility for extended stockpile model accuracy and capability	Jul 11 – May 14	Phil Hobson	QUT
QUT051	Revenue diversification from sugarcane fibre: novel technologies for the processing of bagasse for low-cost biofuels production	Jul 11 – Aug 14	Ian O'Hara	QUT
QUT056	Flocculation and sedimentation of slow settling mud and mud cake conditioning	Jul 12 – Jan 15	William Doherty	QUT
UQ048	Sugarcane feedstock into fuel additives and chemicals: conversion to Furan derivatives by catalytic processes	Jul 11 – Sep 14	Jorge Beltramini	UQ

Strategy: Transport efficiency

QUT033	Improving the efficiency of traffic office operations through improved traffic officer training	Nov 08 – Aug 14	Geoff Kent	QUT
QUT047	Increasing harvest and transport efficiency through the use of locomotive GPS	Oct 11 – Aug 14	Geoff Kent	QUT

APPENDICES

Appendix A (continued)

All active SRDC projects 1 July 2013 to 30 September 2013

Program 3: Sustaining the environment

Strategy: Positioning industry as a leader in environmental responsibility

Project No	Title	Period	Research Contact	Organisation
CGH003	The Herbert Catchment Water Quality Monitoring Project	Jul 11 – Jun 14	Jeff Cantamessa	TNRM
CPI020	Sugarcane compositional analysis to enable food safety assessment of modified varieties	Jul 10 – Jul 13	Anne Rae	CPI
CPI022	Seed dormancy and establishment: a critical gap in the knowledge to support safe deployment of genetically modified sugarcane.	Jul 11 – Sep 14	Graham Bonnett	CPI
NCA011	Development of precision spray technologies for the Australian sugarcane industry	Jul 10 – Aug 13	Craig Baillie	NCEA
QUT027	Opportunities for the Australian sugar industry in greenhouse gas abatement and carbon trading	Mar 10 – Jul 13	Phil Hobson	QUT
QUT031	Dunder concentration	Jul 10 – Jul 13	Kameron Dunn	QUT
QUT055	Improved modelling of wet scrubbers	Jul 12 – May 16	Anthony Mann	QUT
UQ045	Streamlined life cycle assessment (LCA) tool for assessing the environmental benefits of progressive cane growing	Jul 10 – Sep 13	Marguerite Renouf	UQ

Strategy: Waste minimisation and utilisation

BSS352	Developing measurement tools for nutrients and heavy metals in mill by-products	Jul 12 – May 14	Michael O'Shea	SRA
GGP059	Developing prescription compost to suit specific soils in Maryborough	Feb 10 – Dec 13	Glen Grohn	DAGG
GGP061	Effective use of lower mill mud rates in the nutrition program	Apr 11 – May 14	John Fox	MCC
GGP067	Assessing the impact of biochar in the Herbert cane industry	Jul 12 – Apr 14	Michael Waring	HCMG
QUT053	Process for making bagasse paper pulp	Jul 12 – May 16	Tom Rainey	QUT
SCU003	Development of value-added products from sugar cane boiler ash	Jul 11 – May 15	Malcolm Clark	SCU

Program 3: Sustaining the environment				
<i>Strategy: Preparing for global environment with different resource availability and values</i>				
Project No	Title	Period	Research Contact	Organisation
CPI018	Climate ready sugarcane: Traits for adaptation to high CO ₂ levels	Jul 09 – Nov 13	Chris Stokes	CPI
CSE022	A collaborative approach to Precision Agriculture RD&E for the Australian sugar industry	Jul 09 – Sep 14	Rob Bramley	CSE
CVA003	Managing Climate Variability Program Phase 2	Jul 07 – Aug 15	Martin Blumenthal	GRDC
GGP046	Investigate skip row configuration in sugar cane	Aug 09 – Jul 13	Lee Blackburn	BHG
GGP051	Maximising centre pivot efficiencies	Apr 09 – Dec 13	John Fox	PPMGG
GGP065	Using distribution of organic carbon as a basis for reducing nitrogen application rates	Mar 13 – May 15	Tony Bugeja	HIGG
USQ004	Developing targeted, seamless weather/climate forecasting systems for critical early season harvest periods	Jul 13 – May 16	Roger Stone	USQ
BPS002	Sodic Soils and Rising Groundwater Table Management in the Burdekin	Jul 13 – Sep 13	Rob Milla	BPS

APPENDICES

Appendix A (continued)

All active SRDC projects 1 July 2013 to 30 September 2013

Program 4: Skills and capabilities

Strategy: Innovation skills

Project No	Title	Period	Research Contact	Organisation
AFF002	Science and Innovation Awards for Young People	Mar 03 – Dec 13	Maree Finnegan	DAFF
BSS353	Improving capacity in the Australian sugarcane breeding program in analysing and using DNA marker information	Oct 12 – Sep 13	Emily Deomano	SRA
BSS354	Assessment of the current state of phytoplasma sugarcane diseases in South-East Asia	Jan 13 – Jan 14	Robert Magarey	SRA
BSS355	Enhancing sugar mill operating efficiency using integrated laboratory NIR instruments and networked systems	Jan 13 – Dec 13	David Donald	SRA
CPI027	Participation in the International Symposium on New Paradigms in Sugarcane Research	Aug 12 – Jul 13	Phillip Jackson	CPI
CPI031	Strategies for water efficient sugarcane; a CSIRO-EMBRAPA workshop to share knowledge and develop collaborations	May 13 – Sep 13	Anne Rae	CPI
DPI024	Irrigation Bus Tour – Extension of MAF002	May 13 – Mar 13	Brock Dembowski	DAFFQ
NFS003	Advancing Australian sugarcane farming systems	Mar 13 – Jul 13	Mark North	NSWFSG
QUT041	Enhancing and broadening knowledge of evaporation processes through attendance at the ISSCT congress 2013 and visiting Brazilian sugar factories	Jun 13 – Dec 13	Mr Omkar Thaval	QUT
QUT044	Sugar Technology Innovation Scholarships	Jun 10 – Sep 13	Annette Sugden	SRDC
RDC001	Horizon undergraduate research award	Jan 13 – Feb 15	Margo Andrea	RIRDC
SRD051	Grower Group Innovation Project Program Review	May 13 – Aug 13	Annette Sugden	SRDC
STU055	Karen Benn – The motivators and barriers to the adoption of more sustainable farming practices	Sep 05 – Aug 13	Janice Elder	JCU

Program 4: Skills and capabilities

Strategy: Innovation skills

Project No	Title	Period	Research Contact	Organisation
STU065	Milovan Bokan – Abiotic stress tolerant sugarcane: Drought-proofing sugarcane with cell-death protection genes	Feb 08 – Aug 13	Harjeet Khanna	QUT
STU066	Darryn Rackemann – Production of levulinic acid and its derivatives from sugarcane biomass	Jul 09 – Jan 14	William Doherty	QUT
STU067	Kameron Dunn – Conversion of lignin to industrial fuels and chemicals	Jul 09 – Jan 14	Phil Hobson	QUT
STU068	Patrick Bewg – Modification of lignin biosynthesis in sugarcane for the production of cellulosic ethanol	Feb 10 – Jul 14	Heather Coleman	QUT
STU070	Richard Brackin – Microbiology of sugarcane soils	Jan 10 – Dec 13	Susanne Schmidt	UQ
STU071	William Gilfillan – Biodegradable polymer nanocomposites derived from natural fibre and starch	Jan 11 – Jul 14	William Doherty	QUT
STU072	Anthony Brinin – Enhancing sugarcane for decreased water content and increased sugar content at harvest	Jan 11 – Jul 14	Sagadevan Mundree	QUT
STU073	Danielle Skocaj – Climate forecasting to improve sugarcane nitrogen management in the wet tropics	Jan 11 – Jul 14	Yvette Everingham	SRA
STU074	Joshua Howard – Production of furanics and chemicals from bagasse and molasses	Oct 12 – Apr 16	William Doherty	QUT
STU076	Justin Sexton – Identifying and overcoming limitations in crop models with respect to drought tolerance and climate change	Apr 13 – Oct 15	Yvette Everingham	JCU
STU077	Travis Wieck – Investigating the utility of mill mud for soil health conditioning and nutrient use efficiency on sodic soils within the Burdekin	Mar 13 – Sep 16	John Bennett	USQ
STU078	Maren Westermann – Effect of organic nutrients on sugarcane growth, microbial activity and greenhouse gas emissions	Mar 13 – Sep 16	Susanne Schmidt	UQ

APPENDICES

Appendix A (continued)

All active SRDC projects 1 July 2013 to 30 September 2013

Program 4: Skills and capabilities

Strategy: Leadership and decision-making skills

Project No	Title	Period	Research Contact	Organisation
ACF003	Building Future Industry Leaders	Jul 13 – Nov 14	Mr Gerard Puglisi	ACFA
CG022	Mentoring for sugar industry succession and growth	Jul 11 – Jul 13	Ron Mullins	Canegrowers
SRD042	TRAILBlazer scholarship – Established leaders	Mar 12 – Oct 14	Bianca Cairns	SRDC

Strategy: Business practices and value chain improvements

ACF002	A pilot for Business Planning for young farmers and partners in the Sugarcane Industry	Jun 13 – Apr 14	Mr Gerard Puglisi	ACFA
DPI022	Cropping solutions for the sugarcane farming systems of the Burdekin	Jul 11 – Jul 13	Mike Hanks	DAFFQ
MSF007	Boosting productivity in Maryborough by assisting cane growers to understand their soils	Jan 13 – Mar 14	Andrew Dougall	MSF
OHS003	Farming and Fishing Health and Safety Collaborative Partnership (Phase 3)	Jul 13 – Jun 16	Simon Winter	RIRDC

Strategy: Extension and adoption of research

BCA002	Performance evaluation of SRDC R&D investments	Jul 07 – Sep 13	Annette Sugden	SRDC
GGP064a	Pachymetra awareness project for Condong mill area	Jul 12 – Dec 14	Doug Irby	NSW CATE
NCA013	Implementing a framework for farmers to engage in the use of Precision Technologies	Jul 12 – Sep 15	Troy Jensen	NCEA
SRD046	Dissemination of research outcomes	Jul 11 – Jul 13	Carolyn Martin	SRDC

* Note some projects approved for funding did not have contracts completed before 30 June 2013 and therefore the projects will have an SRA contract.

Appendix B

Organisational Identifiers in Project Codes

ACF	Australian Cane Farmers Association	NET	Norris Energy Crop Technology
AFF	Australian Government Department of Agriculture, Fisheries and Forestry	NFS	New South Wales Farming Systems Group Inc
BCA	Benefit Cost Analysis performed by a contracted specialist	NPS	National Program for Sustainable Irrigation
CG	Queensland Cane Growers Organisation Limited	NSC	New South Wales Sugar Milling Cooperative Limited
CGH	Herbert River District Cane Growers Organisation Limited	OHS	Primary Industries Health & Safety Partnership
CPI	CSIRO Plant Industries	QUT	Queensland University of Technology
CSE	CSIRO Sustainable Ecosystems	RDA	Research and Development Activity
CSI	CSIRO	RDC	Rural Research and Development Corporation/s
CVA	Managing Climate Variability Program	RIR	Rural Industries Research and Development Corporation
DPI	Queensland Department of Agriculture, Fisheries and Forestry	RRC	Richmond River Cane Growers Organisation
GGN	Grower Group Network	SCU	Southern Cross University
GGP	Grower Group Innovation Project	SRD	SRDC Commissioned Project
HCP	Herbert Cane Productivity Services Ltd	SRA	Sugar Research Australia Limited
ICS	International Consortium for Sugarcane	STU	SRDC student scholarships
JCU	James Cook University	TNRM	Terrain NRM
LCS	Life Cycle Strategies	UQ	University of Queensland
MSF	Maryborough Sugar Factory	USQ	University of Southern Queensland
NCA	National Centre for Engineering in Agriculture	WS	Workshop – commissioned project

Appendix C

Abbreviations and Acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences	CTCB	Centre for Tropical Crops and Biocommodities at QUT
ACFA	Australian Cane Farmers' Association	DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
ACGC	Australian Cane Growers' Council	DAFFQ	Department of Agriculture, Fisheries and Forestry Queensland
ANS	Advanced Nutrient Solutions	DAGG	Driving Agricultural Goals Group
AOP	Annual Operational Plan	DArT	Diversity Array Technology
APSIM	Agricultural Production Systems Simulator	EOI	Expression of Interest
ASA	Australian Sugar Industry Alliance	GGIP	Grower Group Innovation Project
ASMC	Australian Sugar Milling Council	GIS	Geographical Information System
ASSCT	Australian Society of Sugar Cane Technologists	GIVE	Grower Innovation Virtual Expo
AusAgLCI	Australian Agriculture Life Cycle Inventory	GM	Genetically Modified
BAC	Bacterial artificial chromosomes	GGs	Grower Group Services
BCA	Benefit Cost Analysis	GPS	Global Positioning System
BHG	Blackburn Harvesting Group	GRDC	Grains Research and Development Corporation
BPMS	Business Process Management System	HCMG	Herbert Cane Grub Management Group
BSES	BSES Limited	HCPSL	Herbert Cane Productivity Services Limited
CAC Act	Commonwealth Authorities and Companies Act 1997	HCUPM	Hawkins Creek/Lannercost/Leach United Pig Management Group
CANEG	Canegrowers	HIGG	Homebush Innovative Growers Group
CBP	Capacity Building Project	ICSB	International Consortium of Sugarcane Biotechnology
CCS	Commercial Cane Sugar	ISISPL	ISIS Productivity Limited
CCT	Cannavan Cane Technology Pty Ltd	ISSCT	International Society of Sugar Cane Technologists
CO₂	Carbon Dioxide	JV	Joint Venture
CRDC	Cotton Research and Development Corporation	LCA	Life Cycle Assessment
CRRDC	Council of Rural Research and Development Corporations	LCI	Life Cycle Inventory
CSAF	CSIRO Sustainable Agriculture Flagship	LCS	Life Cycle Strategies
CSIRO	Commonwealth Scientific and Industrial Research Organisation	LUMPSFG	Lump's Farming Group
CSR	Colonial Sugar Refinery (CSR Limited from 1973 and Sucrogen from 2009 and Wilmar from 2013)	MASIS	Mackay Soybeans in Sugar

MCC	Mt Catherine Co-Operative	RIRDC	Rural Industries Research and Development Corporation
MFP	Mackay Fibre Producers	RRCGO	Richmond River Cane Growers Organisation
N₂	Nitrogen gas	ScoPI	Standing Council on Primary Industries
15^N	A rare stable isotope of Nitrogen	SNP	Single Nucleotide Polymorphism
NCEA	National Centre for Engineering in Agriculture	SRA	Sugar Research Australia Limited
NECT	Norris Energy Crop Technology	SRDC	Sugar Research and Development Corporation
NIR	Near-Infrared	SSCS	Smart supervisory/advisory control system
NRM	Natural Resource Management	TRAIL	Training Rural Australians In Leadership
NRP	National R&D Priorities	UV	Ultraviolet
NSWCATE	New South Wales Canegrowers Association Tweed Executive	WIS	Women in Sugar
NSWFSG	New South Wales Farming Systems Group		
NSWSMC	New South Wales Sugar Milling Cooperative		
NWPPA	National Working Party on Pesticide Application		
PCR	Polymerase Chain Reaction		
PEC	Professional Extension and Communications Unit (Sugar Research Australia)		
PhD	Doctor of Philosophy		
PIERD	Primary Industries and Energy Research and Development Act 1989		
PPMGG	Precise Pivot Management Grower Group		
PSII	Photo System Inhibiting		
QAAFI	Queensland Alliance for Agriculture and Food Innovation		
QDAFF	Queensland Department of Agriculture, Fisheries and Forestry		
QTL	Quantitative Trait Loci		
QUT	Queensland University of Technology		
R&D	Research and Development		
RD&E	Research, Development and Extension		

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Appendix D

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Neil McKenzie from the University of Queensland is the winner of the 2013 SRDC Research Technician Award. Pictured with Floren Plaza at the Gas Anti Solvent Pilot Plant.



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