

Annual Operational Plan 2009–2010

Investing in Sugarcane Industry Innovation



Australian Government

Sugar Research and Development Corporation

ANNUAL OPERATIONAL PLAN
2009–2010

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Introduction

The Sugar Research and Development Corporation (SRDC) is a statutory authority of the Australian Government, established under the *Primary Industries and Energy Research and Development Act 1989* (the PIERD Act).

SRDC's focus is the delivery of its **Corporate Outcome**:

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

SRDC operates by way of its core business or **Mission**:

To foster an innovative and sustainable Australian sugar industry through targeted investment in research and development

SRDC functions as an R&D investment body and partner, drawing on funds provided by both the sugarcane industry and the Australian Government.

Section 19 of the PIERD Act requires SRDC to develop and prepare a written Research and Development Plan. SRDC's R&D Plan 2007–2012 was finalised by the SRDC Board in July 2007 after extensive stakeholder consultation, and approved by the then Parliamentary Secretary for Agriculture, Fisheries and Forestry in August 2007.

Section 25 of the PIERD Act requires SRDC to develop and prepare a written Annual Operational Plan (AOP). The AOP is required to set out the broad groupings of eligible activities that the Corporation proposes to fund in the year ahead. The AOP must also describe the extent to which these activities give effect to the R&D Plan in force during the year. This document is the SRDC AOP for 2009–10, and is aligned with the approach, structure, outcomes and deliverables of the R&D Plan 2007–2012.

The Annual Operational Plan also incorporates an outcome/output framework to facilitate performance reporting required by the *Commonwealth Authorities and Companies Act 1997*.

This AOP firstly outlines key elements of the R&D Plan 2007–2012, including SRDC's vision, investment approach, drivers and priorities, and in this context describes the Corporation's proposed activities in 2009–10 to deliver against the outcomes of the R&D Plan.

SRDC's Vision and Investment Approach

SRDC believes that innovation is essential to deliver its Corporate Outcome. Innovation is about looking at things from a different perspective, harnessing the creativity of people, and taking advantage of new technology, information and ways of thinking. SRDC expects innovation to beneficially impact all sectors of the industry, and will, within the next decade, have many of the following characteristics.

Across the entire sugarcane industry system or value chain, i.e. across the farming, harvesting, milling, transport and marketing sectors, solutions will be primarily developed and implemented on a mill area or regional basis. There will be increased adoption of the best practice philosophy in all sectors to increase industry productivity, resilience and sustainability. Sector participants will be more committed to working together to increase total revenue from the mill area or region and will be more closely attuned to market signals. People who work in the industry will be developed and the human capital utilised more effectively.

The *farming sector* will utilise emerging technologies more effectively to benefit the value chain as a whole. Water, nutrients, crop biomass, soil organic matter, varieties, and crop rotations will be managed more efficiently, leading to enhanced economic and environmental performance. Improved cane varieties (including genetically modified varieties) will be released faster and will be targeted to specific situations. Growers will have access to a more diverse range of advisory services and will continuously improve their farming and business management skills.

Operations in the *harvesting and transport sectors* will be better integrated and use capital more efficiently. Cane will be better presented to the harvester. There will be fewer and larger harvesting groups with more efficient loading and transport systems. Feedback and payment systems will enable rapid and rewarding improvements to performance for all stakeholders.

In the *milling and marketing sectors*, deregulation will enable closer and more direct business relationships between millers, their suppliers, and their various customers. Raw sugar will remain the dominant commodity, but will be supplemented by products such as energy, animal feeds, and the specialty outputs of biotechnology.

SRDC is committed to setting the right targets for R&D investments, to making sound investment decisions that address those targets using rigorous transparent processes, to managing investments so that they succeed, and to ensuring that R&D delivers outcomes for its stakeholders and builds capacity for change, learning and innovation across the industry.

SRDC plays a national role in planning R&D for the sugarcane industry. SRDC takes a strategic view of the needs and opportunities for R&D and seeks investment opportunities to foster innovation that will benefit both the industry and the community. SRDC responds to the priorities, needs, and views on R&D of its major stakeholders—the sugarcane industry, the Australian Government, and the general community—and is accountable to them.

SRDC invests in R&D to find new and improved ways of doing things rather than investing in ongoing core services that are the responsibility of others, or basic research to generate new knowledge for its own sake. It also invests in a range of foresight activities that guide its setting of investment targets.

SRDC invests in R&D conducted by others and does not carry out research in its own right. SRDC enters into cooperative partnerships with sugarcane industry participants across its sectors, the R&D agencies, other rural R&D corporations, and the general community. It regards its partners as co-investors in the quest for a profitable, internationally competitive and sustainable Australian sugarcane industry. Through its investments, SRDC shares in the risks associated with R&D.

SRDC strives to deliver high rates of return on its R&D investment by managing technical and market risk and by applying significant resources to translate research outputs into practical outcomes.

Operating Environment

Key Industry Drivers

The Australian sugarcane industry is strongly influenced by the twin drivers of *globalisation and competition*. Other major drivers or forces which can be viewed as either threats or opportunities for the industry—or a combination of both—include *climate change*, societal pressure for industries to be more *environmentally and socially sustainable*, concerns about *biosecurity* and the *safety and health* implications of processes and products, the desire to enhance *human capital*, and the availability of new *enabling sciences and technologies*.

The Australian sugarcane industry sells a high proportion of its raw sugar production into the world market, so it is very familiar with *globalisation and competition* as drivers. International demand is expected to increase broadly in step with population growth. Although the Australian dollar is currently favourable to growers, terms of trade in the longer term are likely to continue to decline because of more rapid increases in input costs than prices received for bulk products like raw sugar. Prices are expected to be linked with timing of supply and demand and with the costs of production of the most efficient exporting country. Brazil's industry is highly integrated across the industry value chain and well supported by government policies, and Brazil is expected to remain the benchmark against which all sugar exporting nations must compete. Another aspect of globalisation is the global mobility of people and goods, coupled with the increasing intensity of some natural processes, which will necessitate a heightened focus on proactive management of biosecurity risks.

Changes in global and regional climate are already impacting on agricultural industries, and over the next 50 years are expected to have important implications for sugar producing regions. Considerable interest and activity (at least in analysing the issues and proposing options for action) is underway nationally and internationally. Sugarcane is among the crops with the highest potential productivity in terms of biomass per unit area, and is expected to play a significant role in the development of renewable biological energy sources. Changing expectations of societies around the world, particularly in more developed countries, are also putting increasing pressure on all industries to be sustainable and to take greater account of environmental and social effects (the triple bottom-line thrust).

Thus, *environmental and social accountability* is increasingly important and being imposed internationally, nationally and regionally. Sustainable management of the industry's natural resources is accepted as critical to its long-term viability, from both economic and ecological perspectives. The *safety* of production processes and the resultant products is also of increasing concern to consumers. The awareness of the balance between the *human health* benefits from food energy supply and adverse effects such as obesity and diabetes is increasing. Finally, the need to maintain and enhance *human capital* is widely seen as critical to future industry competitiveness. Skills shortages in rural industries are recognised as a serious threat to future economic, environmental and social performance.

Industry and Government Priorities

The following diagram outlines the priorities established by the Australian Government through the PIERD Act and the National and Rural R&D priorities, and the broad strategic industry needs identified through consultation. SRDC analyses these priorities and identifies how R&D can best be targeted to deliver outcomes that meet the expectations of industry, government and the community.

<p>AUSTRALIAN GOVERNMENT:</p> <p>OBJECTS OF THE <i>PRIMARY INDUSTRIES AND ENERGY RESEARCH AND DEVELOPMENT ACT 1989 (THE PIERD ACT)</i></p>
<ul style="list-style-type: none"> • Increase economic, environmental and social benefits • Achieve sustainable use and management of natural resources • Make more effective use of human resources and skills • Improve accountability for expenditure



AUSTRALIAN GOVERNMENT		SUGAR INDUSTRY
National Research Priorities	Rural R&D Priorities	Strategic Needs
<ul style="list-style-type: none"> • An environmentally sustainable Australia • Promoting and maintaining good health • Frontier technologies for building and transforming Australian industries • Safeguarding Australia 	<ul style="list-style-type: none"> • Productivity and adding value • Supply chain and markets • Natural resource management • Climate variability and climate change • Biosecurity <p>Supporting the priorities:</p> <ul style="list-style-type: none"> • Innovation skills • Technology 	<ul style="list-style-type: none"> • International competitiveness (particularly through reforms that develop mill areas as the major business unit of the industry, manage scale, apply capital effectively throughout the value chain, and improve commercial understanding and skills) • Profitable and sustainable farming and harvesting systems at the mill area/ regional level • Profitable, efficient and sustainable transport, milling and marketing systems at the mill area/regional level • Appropriately-trained, high-calibre, committed people throughout the industry

Industry and R&D Environment

The Australian sugar industry produces raw and refined sugar from sugarcane. Income is also derived from by-products including ethanol and molasses, and from generation of electricity. While on average, Australia produces only 3–4% of the world sugar supply, it exports approximately 8% of the sugar traded worldwide. In recent years, Australian sugar production has ranged between 4.5 and 5 million tonnes per annum, depending on seasonal conditions. The medium-term forecast is for Australian production to stabilise at just under 5 million tonnes per annum. International sugar prices can fluctuate considerably from year to year, and real returns in Australian dollars are often only marginally above the cost of production.

World sugar prices and foreign exchange rates are expected to be favourable to Australian growers during the 2009–10 year. Demand from developing countries including China and India, combined with the European Union reducing production in the medium term, are likely to maintain some upward pressure on price. Brazil's continuing emphasis on using sugar for the production of ethanol as an alternative fuel is also reducing competitive pressures on world sugar prices. Declining global economic conditions are likely to impact on consumers' behaviour generally during the 2009–10 year; however, due to sugar being seen as an essential commodity, the economic downturn is not expected to greatly affect household or aggregate sugar consumption, with only a slight dampening of demand (ABARE, *Australian Commodities*, vol. 16, no. 1, March 2009).

Australia's gross value of cane produced in the five years to 2008–09 varied between \$870 million and \$1,220 million, and is forecast to come in at the lower end of that range in 2009–10. Although Australia's total production is expected to drop marginally, the export value is expected to increase due to the favourable foreign exchange rate and the ability to lock in forward prices.

SRDC obtains income from levies paid by the sugar industry, matching funds from the Australian Government, and from interest. The levy is set by the Minister on the advice of SRDC's representative bodies, and in 2009–10 is expected to remain at \$0.14 per tonne of sugarcane harvested, divided equally between growers and millers.

Corporate Governance and Operations

Enabling Legislation and Legislative Objectives

SRDC was established under the *Primary Industries and Energy Research and Development Act 1989* (the PIERD Act) on 1 October 1990. As an Australian Government Statutory Authority it is also subject to the *Commonwealth Authorities and Companies Act 1997* (the CAC Act).

Objectives of SRDC

The objectives of SRDC are directly related to the objects of the PIERD Act. They are to:

- improve the competitive position and cost efficiency of the Australian sugar industry;
- achieve sustainable use and sustainable management of the natural resource base of the sugar industry;
- apply industry, scientific and community resources more effectively to R&D in the sugar industry; and
- manage SRDC resources efficiently and improve the accountability for expenditure on R&D for the sugar industry.

Responsible Minister

SRDC is responsible to the Australian Parliament through the Hon. Tony Burke MP, Minister for Agriculture, Fisheries and Forestry. The Minister:

- approves the five-year Research and Development Plan and the Annual Operational Plan
- appoints Directors of SRDC on the recommendation of the Sugar Research and Development Corporation Selection Committee
- appoints the Chair of SRDC.

Rural Research and Development Council

In early 2009, the Minister formed a Rural Research and Development Council to investigate opportunities to improve productivity and environmental outcomes throughout the value chain, from paddock to plate.

The Rural Research and Development Council is now the government's key advisory body on rural research and development. The principal goal of the council is to provide high level advice and coordination to better target and improve the effectiveness of the federal government's investment in R&D.

Industry Representative Organisations

The PIERD Act prescribes the following representative organisations of SRDC:

- Australian Cane Growers' Council Limited (ACGC)
- Australian Cane Farmers' Association Limited (ACFA)
- Australian Sugar Milling Council Proprietary Limited (ASMC)

SRDC is accountable to both the Australian Government and these representative organisations. SRDC meets formally with the representative organisations at least three times each year to discuss SRDC activities, statutory reporting, levy arrangements, R&D priorities and any other matters of mutual interest. No payments are to be made to the representative organisations in 2009–10 in relation to these consultations or for any other purpose.

Corporate Governance Framework

The SRDC Board sets the Corporation's strategic direction and delegates responsibility for day-to-day management to the Executive Director. The Board is committed to governance systems that enhance performance and ensure that SRDC is operating according to accountability provisions of the PIERD Act and the CAC Act. An Audit Committee of three non-executive directors appointed by the Board provides advice to the Board to assist it in fulfilling its responsibilities relating to accounting, reporting and compliance practices of the Corporation.

The Board has established the following Corporate Governance Framework for SRDC.

SRDC Corporate Governance Framework

Leadership

SRDC operates under the direction of a Board. The role of the Board is to approve overall strategy, budgets and large financial decisions. The Executive Director leads the SRDC management team and is accountable to the Board for day-to-day operation of the Corporation. The Board has two committees—an Audit Committee to provide advice on accounting, financial reporting, compliance practices and risk management, and a Scholarships Committee which provides advice to the Board on policies relating to scholarships and the awarding of scholarships.

The key Board functions are:

- establishing goals, setting strategic direction, approving the annual budget and approving large items of expenditure
- developing and approving a five-year R&D Plan, an Annual Operational Plan, Portfolio Budget Statement and producing an Annual Report
- establishing and approving policies for the operation of SRDC
- ensuring that risk assessment and management frameworks are in place to minimise business and financial risk
- ensuring that R&D resources are allocated to address priority issues effectively
- ensuring compliance with applicable laws and provisions of the CAC Act
- ensuring that Directors and staff maintain the highest ethical standards in accordance with the Code of Conduct
- appointing, appraising, and setting the level of remuneration for the Executive Director
- evaluating its own performance and that of its committees and SRDC management against agreed indicators.

Planning and Reporting

The five-year R&D Plan defines SRDC's core business, indicates broad priorities for R&D and defines the corporate strategy to achieve its outputs and outcome.

The Annual Operational Plan (AOP) specifies the broad groupings of R&D activities that SRDC proposes to fund during the financial year together with an estimate of income and expenditure. The AOP must be submitted to the responsible Minister for approval and a copy forwarded to each of SRDC's representative bodies.

The SRDC Portfolio Budget Statement summarises SRDC's outcome, outputs, performance information and financial position each year. It is consistent with the five-year R&D Plan and the AOP and is tabled in Parliament.

The SRDC Annual Report gives particulars of R&D activities funded during the year (inputs), and a review of how SRDC has performed in relation to the objects of the PIERD Act, the SRDC R&D Plan and its corporate outputs and outcome. The Annual Report must be submitted to the responsible Minister for tabling in Parliament and provided to each of SRDC's representative bodies.

Accountability

As required by Sections 15 and 16 of the CAC Act, the Chair of SRDC advises the responsible Minister in writing of significant events affecting the operation of the Corporation, and the general operations of the Corporation. It is SRDC policy for the Chair and Executive Director to also consult personally with the Minister twice yearly, and to write to the Minister after each face-to-face Board meeting outlining key decisions taken.

The Chair and Executive Director meet three times each year, in March, July and November, with the executive of SRDC's three representative bodies to discuss SRDC's Annual Operational Plan and Annual Report and investment needs and priorities.

Management

The SRDC Business Process Management System (BPMS) folds active quality assurance into the daily management of SRDC. It is an essential tool in managing risk and controlling fraud and its annual audit is overseen by the Audit Committee.

Financial Control

SRDC maintains accounts and records of transactions in accordance with accepted accounting principles. Financial statements are prepared in accordance with Schedule 1 of the CAC Act and Australian Accounting Standards.

Risk Management

SRDC's risk management system is detailed in its Risk Management, Fraud Control and Business Continuity Plans. These cover all of SRDC's activities from portfolio to project level including transactions with external providers and contractors.

Monitoring

The SRDC R&D Plan 2007–2012 outlines strategies and performance measures that provide a framework for monitoring activities and measuring corporate performance. At the operational level, the Business Process Management System (BPMS) details processes for monitoring and assessment of SRDC's R&D activities and management performance.

Board Membership 2009–10

Directors expected to hold office in 2009–10 and their terms of appointment are:

Chairperson	Mr I Knop AM	30 September 2010
Deputy Chairperson	Mr S Guazzo	30 April 2011
Executive Director	Dr FC Botha	1 January 2012
Nominated Directors	Mr MA Braude	30 April 2011
	Mr DJ Campbell	30 April 2011
	Ms CA Coppo	30 April 2011
	Mr IR Sampson	30 April 2011
	Ms AM Williams	30 April 2011
	Dr A Pressland	30 April 2011

Corporate Structure

SRDC’s Corporate and staffing structure is indicated in the following diagram.



Operational Procedures for Investment Decisions

The SRDC Board conducts a strategic analysis of the investment portfolio, reviews progress towards achieving its corporate outcome and outputs, and considers whether the R&D Plan requires amendment. It also reviews the performance of both the Board and Management of SRDC, and considers any changes necessary to policies and operating procedures, financial reporting, reporting systems and internal controls. These are detailed in the Business Process Management System (BPMS). The SRDC Board reviewed its R&D activities and management systems in May 2009.

SRDC invests in four types of projects:

- **Research Projects** are SRDC's core investments in R&D and comprise around 90% of project funding. Expressions of Interest (EOI) will be announced in early July each year for projects to commence from the following July. Proponents of selected EOIs are requested to develop a Full Research Project Proposal in consultation with, and supported by SRDC, for final submission by the end of November.
- **Scholarship Projects** support postgraduate study. Applications are advertised on the SRDC website annually for projects to commence at the beginning of each calendar year.
- **Capacity Building Projects (CBP)** are small projects which support specific learning opportunities for individuals or groups. Two calls for CBPs are made annually, and advertised on the SRDC website, for activities to be conducted in the following calendar and financial years, respectively. These were previously known as Travel and Learning Opportunities (TLOPs).
- **Grower Group Innovation Projects (GGIP)**, are conducted by grower groups, and from 2009–10 will be advertised on the SRDC website for projects to commence at the beginning of the calendar year.

In July 2008 SRDC called for Research Project Expressions of Interest (RPEOIs), for projects to commence from July 2009, as well as Scholarship Projects and TLOPs to commence from January 2009. In February 2008, SRDC called for TLOPs to commence from July 2009.

Scholarship proposals are assessed by the SRDC Scholarships Committee. Applications for research projects, CBPs and GGIPs are assessed by a panel of external experts and internal assessors.

The portfolio of projects outlined in this Annual Operational Plan includes continuing projects commenced prior to 2009–10, and new research projects approved by the Board in March 2009. Commencement of new projects is subject to finalisation of the proposals and execution of Project Agreements. Budget allocations for new GGIPs and CBPs to commence during 2009–10 are also included in this AOP.

Outcomes, Outputs and Resourcing

Outcomes, Outputs and Inputs in the R&D Plan 2007–2012

The SRDC R&D Plan 2007–2012 outlines three Investment Arenas on which the R&D portfolio is based. It nominates Arena Outcomes and Outputs, and provides target ranges for the allocation of resources to the Investment Arenas. The following diagram illustrates the relationships between SRDC’s Corporate Outcome, Arena 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 Arenas	Regional Futures	Emerging Technologies	People Development
Arena Outcomes	<i>Implementation of innovative farming, harvesting, transport, milling and marketing systems tailored to the needs and opportunities of each region</i>	<i>Rapid translation of relevant emerging technologies that will enhance the industry’s competitive edge in the global marketplace</i>	<i>Development of individuals and networks across the sugarcane industry that enhance the capacity for continuous improvement</i>
Outputs	<ul style="list-style-type: none"> • Value chain integration • Farming and harvesting systems • Transport, milling and marketing systems 	<ul style="list-style-type: none"> • Genetics and breeding systems • Farming, harvesting, transport, milling, and marketing systems 	<ul style="list-style-type: none"> • Individual capacity • Social capacity
Inputs—proportion of resources	60–65%	20–25%	15–20%

Resourcing of Outcomes and Outputs in 2009–10

The total SRDC budget for 2009–10 will be \$10.044 m. The forecast revenue and expenditure for SRDC for 2009–10 are shown in Table 1, compared with the estimated budget result for 2008–09. Forecast revenue is lower in 2009–10 compared to 2008–09, due to lower crop size and lower forecast crop value (the crop size impacts the industry contribution and the crop value impacts the Commonwealth contribution). Projections are conservative and based on a crop size of 32 million tonnes.

As a consequence of the first payment for the Regional and Community Projects (RCP) there will be a draw down from reserves of around \$0.7 m in 2009–10. The first tranche of funding for the RCP projects was received from the Commonwealth in 2008–09 and is held in a separate account and accounted for separately.

SRDC is also expecting to draw down from reserves to support project commissioning to address research priorities. This will be dependant upon the outcome of negotiations undertaken in the contracting of new research projects identified already for funding in 2009–10. While currently high (around 92% of expected expenditure), reserves include \$2 million in RCP funding. SRDC is not expecting to draw down on reserves; however, if through the negotiation of projects specific issues are identified for attention, reserves may be utilised.

The forecast Operations Budget for 2009–10 of \$2.009 m is 11% less than the 2008–09 budget, and includes a staff budget that is 21% less than in 2008–09.

Table 1 SRDC Budgets 2008–09 and 2009–10

	2008–09	2009–10
Estimated Crop Size (sugarcane cut for crushing)	32.10 mt	31.50 mt
Estimated Gross Value of Production (GVP)	\$917 m	\$900 m
Levy rate/tonne	\$0.14	\$0.14
INCOME		
	\$m	\$m
Industry Contribution	4.494	4.410
Australian Government PIERD Act Contribution	4.975	4.503
Australian Government RCP Project Contribution & FMS Funding	1.000	0
Interest & Other	0.620	0.420
TOTAL INCOME	11.089	9.333
EXPENDITURE		
	\$m	\$m
Continuing Projects	6.958	6.135
New PIERD Act Projects	1.608	1.200
New RCP Projects	0.700	0.700
Total Projects	9.266	8.035
Operation of SRDC	2.251	2.009
TOTAL EXPENDITURE	11.517	10.044

Note: Project expenditure only includes projects that were contracted as at April 2009. Crop estimates and estimates of levy contributions are based on estimates as at April 2009.

Table 2 compares the proposed allocation of resources across Investment Arenas in 2009–10 to the target allocation in the R&D Plan. These data do not include the allocation to RCP projects as this is a special Commonwealth program. The proposed investment in the People Development Arena is somewhat above the target range while the proposed investment allocations in the other two arenas are marginally below the target ranges. This higher level of investment in People Development reflects strong take-up of SRDC Scholarships, Bursaries and Grower Group Innovation Projects (GGIPs). It is intended that these highs and lows across the targets will be averaged over the five-year span of the Research and Development Plan 2007–12, to fall within the target allocations.

Table 2 also shows numbers of continuing and new projects approved at April 2009. Additional projects, including new bursaries and GGIPs, will be considered subsequent to the submission of this AOP, and final expenditure will be conditional on execution of project agreements. Projects approved at April 2009 (except for Commercial-in-Confidence projects) are listed in Attachment A.

Table 2 Target and proposed allocation of resources across Investment Arenas, and indicative numbers of continuing and new projects, for 2009–10 (excluding RCP projects)

	Investment Arena			Total
	Regional Futures	Emerging Technologies	People Development	
Target Allocation in R&D Plan	60–65%	20–25%	15–20%	100%
Allocation 2009–10 (%)	59%	18%	23%	100%
Project Numbers:				
Continuing	49	14	13	76
New Research	16	6	1	23
Scholarships	—	—	13	13
Total	65	20	27	112

Note: This table only includes projects that are contracted as at April 2009.

Projects or Consultancies Undertaken by Representative Bodies

The 1998 Consultation Guidelines require that Annual Operational Plans outline the details of the overall nature, purpose and expected outcome of projects or consultancies undertaken by representative industry organisations. No research and development projects will be undertaken by SRDC’s Representative Bodies in collaboration with SRDC in 2009–10, and SRDC will make no other payments to these organisations.

Monitoring and Evaluation

At the Investment Arena Level

During the term of the R&D Plan 2007–2012, SRDC will monitor and evaluate its performance in achieving the three Investment Arena outcomes. Reports, case studies, and surveys will be conducted to document and illustrate these achievements. Key Performance Indicators and Measures in each Investment Arena over the term of the R&D Plan are listed in Table 3.

Previous, continuing and some new R&D investments are expected to deliver benefits during 2009–10 in the form of improved economic performance of sugarcane growing, harvesting, milling and marketing enterprises; in regional and national economies; improved environmental outcomes on farms, mills and in downstream ecosystems; and social benefits for the people of the industry and their communities, and in the broader networks in which industry people are engaged.

At the Project Level

Benefits expected from project investments in 2009–10 are outlined in the following section which describes those investments in detail.

Evaluations of achievement at the Investment Arena level will be supported during 2009–10 by monitoring and evaluation of each individual project, in terms of delivery against agreed outputs and outcomes. Each Project will be required to conduct a baseline evaluation and assess its performance in terms of outputs and outcomes delivered against that baseline, and to clearly enunciate the pathway to delivery of outputs and to achieve intended outcomes.

At the Corporate Level

In evaluating its own performance as an R&D investment corporation, SRDC will, in addition, consider its performance against the following three overarching questions:

- Are SRDC's R&D investments well targeted and responsive to priority needs?
- Is SRDC delivering on industry priorities and the Australian Government's national and rural research priorities?
- Is SRDC continually improving the management of its R&D portfolio by learning, experimenting, and influencing beneficial change?

The processes that SRDC uses in addressing these questions include an annual Review of SRDC Performance by the Board; annual consultations on SRDC results and performance with the Representative Bodies and with industry representatives in each region/mill area; and evaluations by the Board of the effectiveness of various groups and types of projects. An external review of the effectiveness of SRDC's investment for five years to June 2008 will be completed in late 2009.

Table 3 Key Performance Indicators and Measures for the three Investment Arenas over the term of the R&D Plan 2007–2012, and Targets for 2009–12

Investment Arena: Regional Futures	
Key Performance Indicators	Enhanced structure and functioning of regional sugarcane industry value chains
Measures	Demonstration of improved integration of the industry value chain within regions delivering increased profitability and more efficient use of capital based on environmentally responsible and safe, business practices
Targets 2009–10	<p>An accessible web-based harvest planning tool developed and made available to improve decision of growers, harvesters and millers in the Tully Region. (CGT001) These internet/web-based tools will improve logistic management skills for harvest logistics.</p> <p>Development and implementation of the SHIRT system (Supply and Harvester Information in Real Time), which presents all value chain participants in the Clarence River area (from growers through to mill staff) with near real time information about activities along the value chain to aid them in their decision making process. (CHC002)</p> <p>A framework for analysing the general environmental risks of GM sugarcanes and strategies to minimise the exposure of potential hazards from GM sugarcane developed. Well-founded generic recommendations will be made upon which evidence-based regulatory decisions can be made on the release of GM sugarcane. (CRC005)</p> <p>The relationship between NIR measurements and crop responses validated, and NIR calibration equations for most important sugarcane nutrients (N, P, K, S) completed. Electronic cane consignment developed and implemented at Mackay Sugar. This allows the ability to provide in-field mapping of cane constituents at the cane bin level through interfacing to the NIR system, and accurate determination of harvest location of bins from the GPS monitoring system. (CRC038)</p>
Key Performance Indicators	Enhanced resource utilisation in the farming and harvesting sectors
Measures	Implementation of improved farming and harvesting systems that increase revenue and reduce input costs, and concurrently are environmentally and socially sustainable
Targets 2009–10	<p>A model created which integrates Area Wide Natural Resource Management projects and improves understanding of the factors contributing to rising watertables in the Burdekin. Burdekin’s growers capacity increased to monitor and manage groundwater depths and quality. An Area Wide Management Plan for groundwater resources in the BRIA and a custom built website to relay information developed about the project and its findings to project participants and other stakeholders. (BBF001)</p> <p>Increased knowledge of the risk of grub infestations and their impact on cane yield in new cropping systems through development of Guidelines for grub management in a new cropping system. A monitoring procedure for Childers canegrub that is acceptable and viable for growers developed. (BSS266)</p> <p>Soil Capability and Management Package (SCAMP) for on-farm management decision making developed. Best-management nutrient practices recommended at block scale using site/soil specific nutrient recommendations and risk assessments of on- and off-site consequences of management practices. (BSS268)</p> <p>An increased understanding of improved sugarcane farming systems. Demonstration of the cost savings/profitability improvements and benefits associated with combining legume breaks, controlled traffic and minimum tillage. A better understanding of: irrigation and rainfall use efficiency under new systems; the role of sugarcane trash in sustainable farming systems; the machinery requirements for the new system; the variety/ideotype required to best suit new sugarcane farming systems; nitrogen dynamics associated with fallow legumes and sugarcane in minimum/zero tillage systems; and how other crops fit into the sugarcane system. (BSS286)</p> <p>A web-based variety-selection decision-support tool that will be accessible by growers, extension staff and other industry personnel developed. A model for grower decision making for variety selection will be provided. (BSS294)</p> <p>Improved irrigation schedules for a group of irrigators based on interactive planning. Evaluation of the “WaterSense” irrigation-management tool which incorporates “Cane-optimiser” with core grower-based on-farm groups in five sugar irrigation regions. Increased implementation by up-skilling of grower participants and irrigation service providers in the use of tools. Possible pathways to provision of commercial advisory services. (BSS297)</p> <p>An understanding of the speed at which smut increases in severity in crops in Southern, Central and Herbert districts, and in particular, an understanding of the effect of varietal resistance and climatic conditions on spread and increase in disease severity. (BSS302)</p> <p>Grower-implemented irrigation and dry-off scheduling tools developed, resulting in improved crop yields and harvest schedule management. Increased knowledge of the changes in cane physiology during water stressing of mature cane. Irrigation methods to maintain late-stage crop yields. (BSS304)</p>

Investing in Sugarcane Industry Innovation

<p>Targets 2009–10 <i>continued</i></p>	<p>A review publication of the opportunities to improve the design and performance of sugarcane harvesters. This will include the benefits delivered and the opportunities to reduce the costs of harvesting and increase the recovery of sugar during the harvesting operation. It will include identifying where future R&D would benefit the industry and what research, if any, is required to allow the benefits of adoption to be maximised. Industry workshop held to present outcomes of review. (FSA001)</p> <p>Documented trial results on variety performance and recommendations for variety management in the Tully District. A functioning group and entity that will provide a base for ongoing activities with a focus on variety management. (GGP016)</p> <p>A best practice booklet developed for farmers and other organisations who are interested in sediment runoff controls as part of an overall drainage system. Through the booklet, farmers in the Silkwood Drainage Board Area (SDBA) will have a tangible model which they can add to their farm management systems to address erosion control and nutrient runoff in the Great Barrier Reef Catchment Area (GBRCA). (GGP027)</p> <p>Implementation of a regional grub monitoring system developed in Mulgrave during 2003–2006 by BSES, with improvements in the accuracy of predictions. On-farm assessment of the prediction systems proposed by BSES. The development and validation of the Mulgrave GrubPlan approach. (GGP029)</p> <p>Annual grub management plans developed for each participating farm in the Mount Kinchant Growers Group in Mackay; including an evaluation of the effectiveness and economic feasibility of the plans and of a proven predictive model that could be adopted by growers. Development of an early warning system into grub and beetle activity to be able to identify how heavy the infestation will be in the following season. (GGP030)</p> <p>Skills and knowledge of the Central Region Rural Innovation and Support Group (CRRIS) developed to produce industry-specific compost. Description and assessment of an efficient and environmentally sustainable process for use of sugar industry by-products. As a result, fact sheets (prescriptions) to produce and apply sugar industry specific compost will be developed. (GGP034)</p> <p>Completion, design, development and testing of an efficient double row chopper system. (GGP037) Final design of a cost-effective planter available to the cane industry (dual row billet planter that has an increased billet carrying capacity, improved billet feeding mechanism and an improved billet metering system), which will increase adoption and reduce planting costs of controlled traffic/zero tillage systems in the North Clarence Harvesting Co-operative. (GGP038)</p>
<p>Key Performance Indicators</p>	<p>Enhanced processes and product range in the transport, milling and marketing sectors</p>
<p>Measures</p>	<p>Implementation of more productive and cost-effective transport, milling and marketing systems in harmony with the environment and societal expectations</p>
<p>Targets 2009–10</p>	<p>Design specifications and prototypes completed for a vacuum compactor, bin leveller and a machine to raise the net weight of whole cane in bins to combine the two devices (a self propelled multipurpose leveller/compactor). Assessment completed of the performance of the equipment in increasing bin weights, methods of removing compacted cane from bins and protocols for operating the equipment on loading pads. (LEV001)</p> <p>Evaluation and design specifications for a technically and financially viable automated stockpile tarping system including the operating concept, power requirements, component material and sizing, control systems and safety requirements. (QUT028)</p>

Investment Arena: Emerging Technologies

<p>Key Performance Indicators</p>	<p>Enhanced approaches for sugarcane genetic improvement</p>
<p>Measures</p>	<p>Technologies developed that accelerate the delivery of improved varieties for sugar production and value-added products</p>
<p>Targets 2009–10</p>	<p>An improved genetic map of three sugarcane varieties and identification of framework set of SSRs for more efficient future mapping and diversity analyses. 700 SNPs mapped from ESTs which could potentially underlie QTL for traits of agronomic importance. More defined QTL identified as well as new QTL due to improved genome coverage for traits of agronomic importance. Identification of candidate genes which underlie QTL and can be used as perfect markers in marker assisted selection. A significant set of custom bioinformatics databases organising data relevant for more efficient marker discovery in sugarcane that will function as a resource for the Australian Sugar Industry. (CRC006)</p> <p>Knowledge and tools developed to create new sugarcane varieties with efficient nitrogen use. Identification of useful sugarcane germplasm to improve NUE by characterising NUE traits and validate its application in cultivar improvement, matching N source preferences of genotypes with soil N supply, establishing the potential of transgenic approaches to NUE improvement and completing QTL mapping & molecular marker research. (CRC008)</p> <p>Increased understanding of the interactions between sugarcane genetics (gene expression) and environment (including management) with respect to sugar accumulation (which is a current gap in knowledge of sugarcane physiology). Model developed simulating variety—environment—management interactions using APSIM-sugarcane. Recommendations to improve variety choice and cane management for increased CCS and cane yield and for selection systems to identify elite varieties with desired characteristics. (CSE014)</p>

Key Performance Indicators	Enhanced technological innovation across the sugarcane industry
Measures	Technologies developed that improve business performance across different sectors of the sugarcane industry
Targets 2009–10	<p>Development, implementation and evaluation of technologies that automate and coordinate the harvester and haulout interactions. The automation of the harvest process will improve practices to achieve a low cost, high value cane supply for milling, therefore increasing sugar revenue across the value chain. (GRF001)</p> <p>Antisolvent process optimised to extract high quality sucrose and the supercritical extraction process optimised to recover ethanol from the spent liquor or molasses. An economic assessment and technical assessment of gas antisolvent technology for sugar manufacture. (QUT014)</p> <p>Pilot-scale demonstration of a new environmentally friendly bio-refinery process, developed in Australia, for the derivation of furfural, ethanol and lignin-based products from bagasse and field trash. A techno-economic evaluation of the new furfural process benchmarked against the Suprayfield process. Assessment of the suitability of the solid residues from both processes to further value adding using biorefinery fractionation and fermentation strategies developed by the CRC for Sugar Industry Innovation through Biotechnology (CRC-SIIB) and SRI. (QUT015)</p> <p>High value products that can be recovered from hydrolysed bagasse, the residue after furfural production identified. This includes determination of the physico-chemical properties of the residue. Likely revenue associated with each potential product obtained from lignin, cellulose and ash components of the residue determined. (QUT016)</p> <p>A refined and optimised computational fluid dynamics model of a venturi condenser developed. The design and evaluation of the prototype venturi system installed into an existing rain tray condenser finalised. (QUT030)</p>

Investment Arena: People Development

Key Performance Indicators	Enhanced effectiveness of individuals contributing to the sugarcane industry
Measures	Demonstration of improved capability and capacity of sugarcane industry participants to learn, change, collaborate, lead and innovate to advance the sugarcane industry
Targets 2009–10	<p>Enhancement and maintenance of the Australian Agriculture and Natural Resource Online (AANRO) database (AANR01)</p> <p>Attendance of Dr Peter Samson (BSES Principal Entomologist) to the Entomology Workshop of the International Society of Sugarcane Technologists in Argentina in April 2009 and further development (with Dr Frank Drummond at the University of Maine) of a simulation model of greyback canegrub population dynamics. (BSS326)</p> <p>Understanding of the biology of the particular genotype(s) of <i>Saccharum spontaneum</i> that lead to an invasive weed problem and the development of ways to test for the introduction of these traits into modified germplasm. This will be achieved through Dr Graham Bonnett travelling to Panama. As a result and as part of a related project (CRC005) recommendations for the Australian sugar industry to minimize GM risks based on the understanding gained of <i>S. spontaneum</i>. (CPI015)</p>
Key Performance Indicators	Enhanced effectiveness of partnerships and networks contributing to the sugarcane industry
Measures	Demonstration of improved capability and capacity of regional groups, networks, and industry sectors and researchers to collaborate and innovate to beneficially change the operation of the industry
Targets 2009–10	<p>An R,D & E symposium will bring together the research and extension organisations (e.g. CSIRO, ACTFR, BSES, BPS, grower groups—MAFIA, HCL etc.) and present the outcomes of their activities to the Burdekin Sugar Industry stakeholders and the wider community. (BSS315)</p> <p>Integration of acquired understanding of broad-acre Integrated Weed Management (IWM) strategies that minimise the development of herbicide resistance into the planned IWM program for the sugar industry. (BSS321)</p> <p>Developed 'shared vision' amongst all service providers in the Mackay Region and designed and documented plans, principles and processes for regional collaboration to be undertaken after the project completion. (MAP002)</p> <p>Six of our scholarship students complete their thesis in 2009–10. Two new scholarships commenced in July 2009 and a further three new scholarships offered from January 2009. SRDC's annual Scholarships Forums conducted in 2009 providing scholarship holders the opportunity to build their capacity to communicate the results of their research.</p>

Addressing Targeted Outcomes and Stakeholder Priorities in 2009–10

This section outlines SRDC's planned investment activities in 2009–10. The three Investment Arenas provide the basic framework for an integrated description of how the activities address the arena outcomes and outputs and the Australian Government's national and rural R&D priorities.

Australian Government R&D Priorities

The four National Research priorities are:

- **An environmentally sustainable Australia**
- **Promoting and maintaining good health**
- **Frontier technologies for building and transforming Australian industries**
- **Safeguarding Australia**

The Australian Government's Rural R&D Priorities are framed within the National Research Priorities but give a focus on issues relevant to rural industries. The revised Rural R&D Priorities, which have applied since 8 May 2007, are:

- **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 the priorities:

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

Investment allocations across the national and rural R&D priorities are reported in Tables 4 and 5 at the end of this section.

Regional Futures Arena

Arena Outcome: *Implementation of innovative farming, harvesting, transport, milling and marketing systems tailored to the needs and opportunities of each region.*

The Regional Futures Arena focuses on the implementation and/or integration of existing technologies or close-to-market emerging technologies to enhance the economic, environmental and social sustainability of regional sugarcane industries. Some R&D in this Arena will be applicable to all or several regions, while in other cases R&D approaches may need to differ to fit the outcome that each region or mill area is seeking.

Value Chain Integration

Key deliverables in the R&D Plan 2007–2012 across the value chain are: improved value chain operations and payment systems; better utilisation of capital; enhanced preparedness for emerging risks and opportunities; improved environmental stewardship, and improved health and safety of industry people and families.

Improved value-chain operations and utilisation of capital

Projects in several regions are focussing on the facilitation of change across regions and/or mill areas to deliver increased regional income. One continuing project in the Plane Creek area (where there is an existing ethanol plant) is investigating an expanded role for the regional industry in biofuel production (PCS003). The project will conduct a scoping study of the potential for sweet sorghum to be grown as a complimentary crop to sugarcane, to provide additional raw material during the traditional off-season for sugarcane crushing, and thus expand production at the distillery. The study will develop a business plan and a research plan for growing and processing. The research plan will be undertaken in subsequent years if the business proposition is favourable. Given the interest in renewable energy, expansion of ethanol production has the potential to increase revenue across the value chain, improve capital utilisation, and enhance Australia's response to climate change through increased biofuel production from non-food sources.

The Tully mill region will continue trialling harvest management tools with the pilot group and user group, and communicate results to the Tully industry and beyond. An extension program based around the results obtained by the growers using the tools over the 2007 and 2008 seasons will be used to obtain as many users as possible for the 2009 season (CGT001). A web interface for the harvest planning tools will be completed and trialled. This includes the development of a live data link interface between the Tully Sugar Limited (TSL) data system and the external hosted harvest planning tools.

A project in the Clarence region, Australia's most southern mill area, and one with a predominance of large two-year crops, has progressed in providing near real-time information about the performance of the various stages of the value chain, which will foster greater productivity and satisfaction within the harvest crews (CHC002). During its final year, the project will benchmark the benefits of implementing the communication systems developed in the project, make improvements to the system based on feedback received from users and communicate those benefits to the Australian industry.

SRDC will review its regional communications activities in 2009–10. An alternative format will be developed for the regional workshop series which have been conducted for several years. Regional communication is essential to communicate the strategic direction of SRDC and assess the ongoing relevance of the R&D Plan, develop regional R&D proposals, and foster the capacity of researchers and stakeholders to conduct collaborative and participatory action research. (WS009)

Enhanced industry preparedness—Climate change and improved varieties

Managing the impacts of climate variability and climate change are important factors in enhancing the robustness of regional value chains. The global need to reduce carbon emissions provides opportunities and potentially increased costs for the sugarcane industry that need to be assessed. SRDC will continue to collaborate with the RDCs to develop and implement the National Climate Change Research Strategy for Primary Industries released in 2008. The venture will identify collaborative research opportunities that assist primary industries to understand, and build capacity to meet, climate change mitigation and adaptation needs. SRDC will continue its support to improve seasonal forecasting and provide tools and services to on-the-ground manage climate risk through its investment in the Managing Climate Variability Joint Venture. (CVA003)

A continuing project will determine the skill of a long lead climate forecasting model in the Australian sugar industry, and assess industry demand for a forecasting model that can predict in February, the probability of rain during the second half of the harvest season. (JCU027) The model has been applied in selected regions to deliver information that improves decision making and enables more precise marketing forecasts. Emphasis during the final year of the project will be to assess how the long lead forecasts have influenced industry planning. Improved strategic planning could potentially deliver benefits through reduced costs associated with wet weather during the harvest season; improved harvest season management and planning, and better decision making.

Regional value chains will be enhanced through a new project that estimates how climate change will affect the statistical distribution of key atmospheric variables relevant to crop production for selected sugarcane growing regions. (FPP821) This research will add to the existing body of knowledge on year-to-year variability in crop production.

SRDC is a core party to the CRC for Sugar Industry Innovation through Biotechnology (CRCSIIB) which commenced in August 2003. SRDC has committed \$4.9 million of project funding over the seven years of the CRC to 2009–10. The CRC has demonstrated considerable potential to benefit the sugar industry and contribute strongly to the national economy through breeding systems and identification of elite sugarcane varieties with enhanced accumulation of sucrose or production specialist materials. One continuing project funded through the CRC is assessing the possibility of cross-pollination of genetically-modified (GM) cane with wild canes and grasses, and transfer of modified genes into other species. (CRC005) The project includes collaboration with the Office of the Gene Technology Regulator to ensure that the results provided by the project are valid and sufficient. This information is essential to enable approval for commercial release of GM sugarcane. The project will also increase the fundamental knowledge of reproductive biology of sugarcane, which will be valuable more broadly than for GM varieties.

Improved health and safety

SRDC has continued its participation in RDC Collaborative Partnership for Primary Industries Health and Safety. (OHS003) Previous investments in this initiative have conducted several projects relevant to sugarcane growers, including the Healthy Farm Families program, all-terrain vehicle safety and injury prevention, children's safety on farms, and incentives for adoption of safe farm work systems. Several of these programs are continuing to have beneficial impact on sugarcane farming families.

Farming and Harvesting Systems

Key deliverables in the R&D Plan 2007–2012 to realise improved farming and harvesting systems are: improved biosecurity risk management; improved management of soil and water resources; improved farm business management; better harvesting equipment and practices, and recognition of the benefits from ecosystem services.

Managing biosecurity risks and enhancing integrated pest management

The sugar industry is vulnerable to attack from invading pests and diseases, considering its location in the tropics adjacent to many of Australia's near neighbours. SRDC has supported several activities to identify potential risks and establish contingency plans to deal effectively with possible incursions. SRDC has also invested substantial funding in recent years in diagnostic and taxonomic investigations to assist with insect and disease quarantine, and on development of plans to assist in preparation for and management of any invasion.

A continuing project has been building on these previous investments to develop an Integrated Sugarcane Biosecurity Plan. (BSS303) The project will update all current incursion management plans in light of new information, changed procedures and lessons from the smut incursion in 2006. It will continue to develop several new plans for exotic pests and diseases including downy mildew, Ramu stunt, sugarcane longhorn borer, Eumetopina planthopper, sugarcane thrips and those moth borers not covered by existing plans. The project will improve knowledge on exotic pests and diseases and their latest management strategies, and on cane biosecurity among biosecurity organisations, industry advisers and cane farmers, to deliver a more secure and prosperous industry with a reduced risk of damage by exotic incursions.

Studies of the epidemiology of sugarcane smut in areas where smut has been identified have determined the speed at which smut increases in severity in susceptible crops, and spreads from infected to uninfected crops. During 2009–10, an extension program based on the results obtained in each major cane-growing region will take place to ensure growers are well-informed on smut developments. (BSS302) The project will collate and summarise variety resistance trial smut inspections for 2009 and advise the industry of the current predicted acceptable varietal resistance for each cane-growing region. This information will optimise the transition from susceptible to resistant commercial varieties, and minimise the detrimental impacts on profitability that affected farms and mill areas may experience.

In partnership with the Commonwealth Government's Rural and Community Projects initiative as part of the Sugar Reform Package, since July 2008, SRDC has invested in a major project to accelerate the development and release of new smut-resistant sugarcane varieties. (BSS325)

The project targets a range of approaches to develop rapid screening technologies for smut resistance and recover high yielding varieties. This program is targeting a doubling of the rate of release of elite varieties within three years.

Canegrubs are the sugar industry's most damaging insect pest. Work will continue to promote adoption of decision support systems for management of greyback canegrub, and to develop means to integrate control of greyback and Childers canegrub into the improved farming systems developed through the Sugar Yield Decline Joint Venture (SYDJV). (BSS266) A reduction in the use of intensive cultivation for control of Childers canegrub will help deliver a farming system based on low-cost minimum tillage that also preserves organic matter and soil biodiversity. Initiatives to reduce insecticide use, being promoted as part of systems approaches to canegrub control, will enable the sugar industry to maintain its record of sugar products free from chemical contamination. Grower Group Innovation Projects in Mulgrave and Mackay are providing grower input into regional grub monitoring programs and integrated pest management.

One of SRDC's postgraduate scholarship recipients is studying the population dynamics of plant hopper *E. flavipes* and its potential for dispersal, in particular, the student aims to gather information on the geographical role of the Torres Strait Islands in the migration of exotic pests towards northern mainland Australia. (STU052) In her final year, the student will synthesise data into an innovative predictive model for *E. flavipes* movement that can be used to manage future incursions through the Torres Strait Islands. Additionally, results may provide information for better surveillance and control or eradication options for *E. flavipes* and contribute to the sustainability and biosecurity of the Australian sugarcane industry, especially in the far north.

Work in NSW is continuing to develop an integrated management and decision support strategy for nutgrass. (NFS002) The project will deliver significant productivity and economic gains by improved nutgrass control, reducing the number of spray applications, and increasing adoption of improved cropping systems (e.g. controlled traffic and soybean breaks) through better opportunities for nutgrass control. The project will provide guidelines for nutgrass control, a decision support package for nutgrass control, and a structured and more effective approach to nutgrass control.

To help protect the industry from exotic pests and diseases, a project will develop and validate specific molecular diagnostic tests and screening tests for known diseases prominent in Papua New Guinea, while also determining pest and disease resistance ratings for the most important Australian varieties, and refining pest and disease incursion management plans. (FPP819)

Managing and improving soil resources

The industry is continuing to implement improved farming systems identified in SRDC's major farming systems investment in the Sugar Yield Decline Joint Venture (SYDJV). The SYDJV has designed and verified the benefits of an improved farming system based on minimum tillage, controlled traffic, trash blanketing and legume rotation crops. (BSS286) The farming system delivers consistently higher yields across the crop cycle through improved soil health, coupled with lower fertiliser, labour and machinery costs. Further studies are underway in several projects that are building on the outputs of the SYDJV. Key ongoing research issues include choice of varieties, nitrogen dynamics, nutrient stratification, interface issues between cane and fallow crops, water infiltration and efficiency of use, indicators of soil biological health including free

living nematodes, and machinery development. The core farming systems project will assist in coordinating several related initiatives, including other SRDC-funded projects described in the following paragraphs, and the Future Cane project funded by QDPI&F and BSES Limited, which seeks to promote adoption of the improved farming systems developed by the SYDJV.

A project in the central district is working with existing groups of innovative growers to develop practical solutions to establishing the second cane-cropping cycle, and break crops, onto permanent beds. (BSS306) Maintaining the beds and crop residues will sustain the soil structure and beneficial biology in the beds. Reduced tillage delivers substantial costs savings, and working with existing grower groups will enhance their creativity and cohesiveness.

An ongoing project funded jointly with the Grains R&D Corporation focuses on the interactions between sugarcane and legume crops in southern canelands. (DPI020) The project will deliver strategies to manage trash at the end of the cane cycle to optimise break crop establishment; improve water use efficiency and maintain a balanced and suppressive soil biology; enhance management of cadmium; and improve understanding of water use efficiency and the soil health impacts of reduced/zonal tillage and wider rotation crop choice. Improved integration of farming systems will provide resilient and profitable farm business, with expectations that whole farm profitability will increase by between 20 and 30%.

A major continuing project is combining the expertise of members of the SYDJV team with capability in soil biology at the University of Queensland. (UQ043) The project will advance knowledge of soil health using powerful molecular techniques and quantitative tools to monitor the functional diversity of soil organisms and identify soil nitrogen and carbon dynamics. The results will deliver enhanced sustainability and productivity of farming systems through improved soil fertility, improved use of nitrogen from sugarcane and legume residues, reduced nitrogen applications and reduced risk of nitrogen losses.

Projects focusing on nutrient management have been integrating the considerable body of past knowledge on nutrient requirements of sugarcane with new research which links nutrient management to specific soil and crop characteristics. Optimal fertiliser management is targeted at both improved profitability and minimising losses of nutrients off-farm. Field evaluation is underway of a hypothesis that nitrogen management based on nitrogen losses during the previous crop, including removal in the cane, would lead to better linking of nitrogen application to crop demand, lower nitrogen use, and reduced nitrogen losses to the environment. A project to be finalised in 2009–10 will integrate results obtained to date and with results obtained with a project concluded in 2008 to review efficiency factors (Kg N/tonne) from all relevant trial data for calculating nitrogen (N) fertiliser requirements of nominated yield goals. (BSS268) It will also complete a computer-based decision tool that incorporates guidelines for N-fertilisation of cane taking into account factors such as soil type, region, seasonal expectations, previous history of field conditions. It will also incorporate and integrate NutriCalc, FertCalc, SafeGauge for Nutrients, and FEAT type applications into a Six Easy Steps nutrient management package. The projects funded in this space will promote improved nutrient management, which will result in better targeted fertiliser application, lower costs and reduced nutrient losses in off-farm water flows, while maintaining or enhancing sugar yields.

A continuing project is coordinating and integrating an evaluation of Precision Agriculture (PA) technologies in collaboration with leading farmers. (CSE022) The project brings together investigators from three leading research organisations, to provide growers with confidence

about means of managing on-farm variability. The project has established experimental sites in Bundaberg, Herbert and Burdekin and collated data available. The next step will be to complete evaluation and refinement of commercial yield monitors and established yield mapping protocols. It will also scope technologies for determining CCS.

A new project will assess available remote sensing technologies to identify the optimum time of image capture and the most appropriate commercial imagery that will accurately depict mid-season crop availability to direct target mid-season management within the Australian cane industry. (FPP818) The project will assess the utility of this imagery for explaining yield variability; implement optimal image processing; deliver protocols for rapid distribution of technology; and provide guidance to industry on remote sensing technology (including indication of the cost/benefit of its implementation).

Another continuing project is developing and promoting techniques for targeted application of best management practices within sugarcane paddocks. (BPS001) The zones are being identified by integrated mapping of satellite imagery, soil electromagnetic induction recordings, other soil properties, and sugarcane yields. The project will continue statistically testing the nature and strength of relationships between soil properties and their electromagnetic responses. Targeting of crop inputs may result in reduced costs, enhanced productivity, better environmental performance through reduced offsite movement of nutrients and chemicals, improved land management practices, and sustained profitability.

An Annual Workshop on Precision Agriculture (PA) will be held at ASSCT in 2010 with project stakeholders, PA researchers and extension staff. Project findings of the current funded projects in PA will provide an overview of their findings to date. Gaps in knowledge and research needs identified and recommendations made to SRDC.

Managing water more sustainably

SRDC has an extensive portfolio of investments targeting improved water management and utilisation efficiency, in keeping with the major national initiative to promote water conservation. SRDC is a partner in the National Program for Sustainable Irrigation (NPSI), a coalition of investors in sustainable irrigation research and innovation throughout Australia. (NPSI01) The NPSI provides leadership through collaborative investment in research and innovation to achieve irrigated landscapes that are environmentally sustainable, and support viable irrigated industries with improved production and offer regions a vibrant future.

Two grower-led projects are examining complementary aspects of sustainable water management in the Burdekin River Irrigation Area (BRIA). Rapidly rising saline groundwater is a threat to much of the BRIA, which has been irrigated for cane production for only about 15 years.

Groundwater is known to be within 1–2 m of the soil surface in two localities. One project, in collaboration with the Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC), seeks to identify the relative contributions to groundwater from furrow irrigation, leaking supply channels and large tail-water recycle dams in the region, as the basis of identifying means of reducing ground water accretion. (BFF001) The project will complete a custom built website to provide growers with information and resources (monitoring equipment) to better manage groundwater, and demonstrate that it is possible to value add to the existing structure

of the Burdekin Cane Productivity Initiative (CPI) growers groups, by developing a model that integrates Area Wide Natural Resource Management projects.

BRIA farms have been laser-levelled and slopes are very slight. The current farming system is designed for furrow irrigation in very long rows (commonly 1–1.5 km) that do not allow retention of harvest residues, because the trash slows water flow, but are cost-efficient for harvesting and other farm management inputs. A second project will continue investigating low-pressure overhead irrigation and drip irrigation through trickle tape, as potential solutions that can both reduce the volume of water applied, and allow green cane harvesting to be adopted without shortening row lengths. (MAF002) Economic comparisons will also be made with an established trickle (drip) irrigation system on a neighbouring property.

A continuing project is implementing a decision support framework for improved irrigation scheduling. (BSS297) The web-based program has been successfully implemented by growers in the Bundaberg area, and the project is extending the irrigation scheduling improvements to most major irrigation regions (including the Burdekin, Mareeba, Central, Bundaberg and Maryborough regions). The project is expected to conclude in 2009–10 and provide a full analysis of the potential for commercial irrigation advisory services in at least one participating region. It will also provide a summary assessment of general worthiness of use of the program as an effective aid to irrigation management. The project will also evaluate a commercial service for delivery of irrigation scheduling advice in selected areas. Related work in the Atherton Tablelands district to be concluded in 2010 aims to develop scheduling tools to enable growers to manage irrigation in maturing crops, including when harvesting is delayed, to maximise sucrose yields and avoid unnecessary watering. The project will increase understanding and knowledge of the changes in cane physiology during water stressing of mature cane, and potentially propose irrigation methods to maintain late-stage crop yields.

A project based in an acid-sulphate soil area in NSW has established a temporary wetland in a cane paddock and is assessing its ability to control toxic discharges and trap sediments that include nutrients and metal compounds (UNW003). The wetland has been designed so that sediments can be removed periodically and returned to the land. This work will conclude in 2009–10, with communication of results and recommendations for the adoption of the results in other locations.

Given that understanding water quality in sugarcane farming systems is an area of high priority in the SRDC research program, SRDC in collaboration with BSES, will lead a group of researchers and industry representatives to develop a possible commissioned project in this area. (FPP844)

Improving farm business and risk-management decision-making

Choice of the optimum variety is a critical factor in maximising productivity and profitability of each farm block. A continuing project managed by BSES will provide a web-based decision-support system to optimise returns from the choice and management of varieties. (BSS294) A grower consultative committee will provide input, and access to mill productivity data on approved varieties will be sought to complement trial data. It is envisaged that an interactive website will enable growers to add their own experiences with varieties to the information available from trials. The best available variety for a situation may improve yields for a whole crop cycle by up to 10–20% compared to less suitable varieties. During its final year, the project aims

to complete testing and improvements to the system and evaluate its acceptance across the sugarcane industry.

Another continuing project, in conjunction with the improved farming systems initiatives, will address a demand from growers for information on the varieties that perform best under controlled traffic farming systems (BSS296). Current varieties were selected under conventional 1.5 m row spacings, and new varieties may be needed for wider rows. The project will determine whether changes are needed to variety selection procedures. The project will provide an understanding of the genotype (cultivar/clone) by row format interaction, and the traits that could be used to predict performance on wider row formats.

SRDC's Grower Group Innovation Projects (GGIPs) play an important role in encouraging growers to interact with other growers and advisers to evaluate R&D outputs in their local area. The main industry gains are likely to be through more rapid adoption of improved practices and farming systems. Up to 21 Grower Group Innovation Projects will be underway in 2009–10 to apply aspects of new farming system principles to specific situations. The range of topics being addressed includes variety selection, planting systems, soil health monitoring, integrated insect and weed pest management, nutrient management, bed-forming and rotation cropping.

Implementing better harvesting systems

Harvesting is a major linking point in the sugarcane value chain. Improved harvest efficiency has potential for economic and environmental benefits for growers, harvesters and millers, through capital and labour efficiencies, and reduced losses of cane and juice during the harvesting process.

Three significant initiatives will continue in 2009–10. Adoption of harvesting best practice (HBP) has been constrained by the difficulty of demonstrating sugar losses from sub-optimal harvesting. A continuing project will build on previous work which developed a method of rapid sugar measurement, to develop a mobile system which enables industry staff to quickly test sugar loss levels in the field. (BSS318) The project has been testing whether Brix refractometry is a reliable method for determining the sucrose content of harvest residue. The next step will focus on developing a system that could be used statewide to test a large proportion of all harvesters on a regular basis in a whole range of conditions. Returns of up to \$50 per hectare are estimated from the widespread adoption of HBP.

A continuing project is the review of opportunities to improve the design and performance of sugarcane harvesters. (FSA001) The review is focusing on machine components and embodied design concepts incorporated by various individuals and organisations rather than complete as-built machines. The impact these components and concepts have on the cost of harvesting and cane supply quality will be assessed. A review publication will be prepared outlining areas of opportunity for improvements to harvester designs, emerging concepts, potential barriers to adoption and development required. Input from harvester manufacturers and international groups working on this issue will be invited.

Transport, Milling and Marketing Systems

Key deliverables in the R&D Plan 2007–2012 to realise improved transport, milling and marketing systems are: reduced operational and maintenance costs, new value-adding opportunities, and new marketing opportunities.

Enhancing cost-efficiency in transport and milling systems

Cane transport remains an area of high expenditure for sugar factories with substantial capital tied up in locomotives and cane bins.

SRDC is supporting a project aimed at reducing transport costs through the automation of schedule generation for both harvesting and transport. (QUT024) This project promises to bring strong benefits to the industry through reductions in locomotive shifts and the number of cane bins required, more widespread use of practical, automatically generated schedules to reduce delivery delays, reduced cane age on delivery which will improve sugar quality, and improved ability to model the harvest transport system and whole value chain leading to lower overall costs.

Further research seeks to achieve a cost effective method of transporting whole cane from the loading pads to the mill in bins provided by a milling cooperative. The project seeks to raise the bulk density of the whole cane in the bins to achieve an optimum cost-effective weight for transport, using techniques that do not involve changing the current methods of cutting, loading and transport. (LEV001)

The Tully Sugar Industry operates in the Wet Tropics and harvesting and crushing operations are subject to the variability in weather conditions. High maintenance standards are in place to ensure high levels of factory availability are achieved when conditions allow crushing operations to occur; however, the Tully evaporator station experiences high rates of scaling and valuable throughput is lost as a result of reduced crushing rate, as scaling increases, and the factory stops to chemically clean the evaporators. A reduction in factory lost time for evaporator cleaning offers opportunities for increased cane crushing and sugar production with the same installed factory capacity. It will provide an improved utilisation of installed assets and also assist in reducing operating costs. This project will reduce the rate of scale formation and improve the rate and impacts of scale removal from the evaporator vessels at Tully mill through a better understanding of the conditions that promote scaling, and a better understanding of the effectiveness of cleaning regimes and effluent disposal. While Tully mill has some unique scale issues, aspects of this work will be relevant to other mills. (TSL001)

New value-adding opportunities

Australian sugar mills are very keen to optimise the use of by-products and maximise environmental safety. In 2009–10, SRDC will support a project that will develop methodologies to convert mill mud and ash (by-products from the cane crushing/sugar production process) enhanced with other nutrients including nitrogen, phosphorous and potassium, into a value added pelletised product that can be sold as a complete fertiliser. A successful outcome will reduce the potentially adverse environmental impacts of mud and ash storage and repeated high application rates on farms close to the mill. (TSL002)

A continuing project will optimise the antisolvent process in sugar refining to extract high purity sucrose from liquor and or molasses. (QUT014) It will also optimise the supercritical extraction process to recover ethanol from the spent liquor or molasses. Antisolvent technology may increase power generation as a consequence of increased waste heat utilisation and a reduction in steam consumption for a sugar mill.

The increasing need for large-scale bagasse storage has highlighted inadequacies in current practice relating to covering stockpiles. These shortcomings impact on occupational health and safety, potential loss of fuel value from rain and wind, and the risk of fire. The research being undertaken in 2009–10 will design and demonstrate a technology for automated tarping of stockpiles. (QUT028)

Emerging Technologies Arena

Arena Outcome: *Rapid translation of relevant emerging technologies that will enhance the industry's competitive edge in the global marketplace.*

The Emerging Technologies Arena recognises that the industry is reliant on strategic research to sustain it into the future. R&D conducted in this arena will mainly involve research on frontier technologies or implementation of more-distant-from-market emerging technologies in the fields of breeding systems, farming, harvesting, milling and marketing systems, biotechnology and diversification.

While directed in the longer term at delivering improved economic, environmental and/or social outcomes, individual R&D projects conducted in this arena may not deliver these benefits in the short term.

Genetics and Breeding Systems

The R&D Plan 2007–2012 recognises the need for R&D to underpin the ongoing development of sugarcane germplasm for multiple uses. Key deliverables in the R&D Plan are: improved breeding systems and evaluation approaches; diagnostic technologies for screening for enhanced disease and stress resistance; enhanced breeding approaches based on improved understanding of the processes of sugar accumulation; and genetic modification of the sugarcane plant for increased industry profitability.

Improved breeding systems to accelerate genetic gain and delivery of new varieties

The provision of improved varieties has been a long-term component of the industry's approach to productivity, and underpinning R&D has been a key area of investment since SRDC's inception.

New developments in DNA marker technologies are emerging from projects being conducted by the CRCSIIB. Research underway will build on this work to identify ways to maximise rates of parental improvement and genetic gain in the Australian sugarcane breeding program. (BSS319) The project will provide 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, developed more rapidly and efficiently.

A continuing project funded through the CRCSIIB is developing a genome map which will cover at least 90% of the sugarcane genome. The map will be utilised for the selection of markers for both association mapping studies and identification of Quantitative Trait Loci. Markers developed in this project could significantly increase the speed of development of new varieties. The map developed in this project will also aid in understanding of various physiological processes occurring in sugarcane. Further research will explore mechanisms for enhanced photosynthetic efficiency to improve sucrose and biomass yields. (CRC006)

A long-term goal of developing water use-efficient and drought tolerant sugarcane cultivars has been progressed through the research program. A project is assessing the variation in currently-available germplasm, and identifying elite clones and/or a rapid screening method to select water use-efficient and drought tolerant cultivars. This represents an additional approach to reduce the impact of recurring drought and the rising cost of water on industry profitability and competitiveness to those outlined in the Regional Futures Arena. (BSS305) A further continuing SRDC project will address mechanisms to increase CCS, cane yield and water use efficiency by exploiting interactions between genetics and management. (CSE014)

Diagnostic technologies for genetic screening

A continuing project will develop and implement new predictive tools for screening against sugarcane smut and Fiji leaf gall. These tools will improve the delivery of resistant varieties in shorter timeframes, and reduce the cost of varietal selection. If successful the project will deliver significant efficiency gains and cost reductions over traditional screening methods. (BSS307) This work will link with the Regional Communities Program project described in the Regional Futures Arena to accelerate the development of smut-resistant varieties.

Improved understanding of sugar accumulation

The role of sucrose in feedback inhibition of photosynthesis of sugarcane plants is not yet fully understood. A better understanding of the basic physiology of sugarcane and existing limitations to higher sucrose content and yield being addressed through current research funded by the SRDC should lead to innovative approaches to crop improvement. Increasing the photosynthetic efficiency of sugarcane will also enhance its natural physiological advantages as a feedstock for the biofuel market. (CSE023)

Work in the CRCSIIB is approaching the goal of increased sucrose content by manipulating the expression of genes shown to be correlated with sucrose accumulation, and identifying suitable promoters.

Genetic modification of the sugarcane plant

Another major continuing project will build on R&D conducted by CSR Sugar and the University of Queensland to develop their "Sugar Booster" technology, which has shown promise of producing the value added-product isomaltulose as well as higher yields of sucrose and other fermentable sugars. This project is exploring pathways for agronomic evaluation and regulatory assessment of GM sugarcane. (UQ040)

Studies conducted through the CRCSIIB are investigating means of producing specialist materials such as bioplastics, enzymes and pharmaceuticals in elite sugarcane varieties, and of improving nitrogen use efficiency.

Sugarcane already represents a natural source of sugar-related commodities, including ethanol as a fuel product. A new project will develop sugarcane as a biofactory for the production of moderate- to high-value, high volume products, thus diversifying sugarcane as a product line for the manufacture of value-added proteins. (FPP828)

Nitrogen use efficiency and climate change

In order to lower growing costs, SRDC will fund two related projects that will advance knowledge of traits that make sugarcane more nitrogen (N) use efficient. Such knowledge will assist in developing tools for breeding nitrogen use-efficient clones, thus lowering nitrogen fertiliser demand. (CRC008 and FPP835) Another project will facilitate the development of cultivars for the Australian sugarcane industry suited to production systems utilising total sugarcane biomass to prepare for, and maximise, the industry benefits expected to arise from emerging commercial opportunities. (FPP843)

Although research projects are under way to investigate approaches that the industry can take to reduce carbon emissions, SRDC will also investigate plant physiological adaptation to climate as a result of inevitably elevated CO₂ conditions. A new project will assess adaptive strategies for the sugarcane plant in terms of improved water use efficiency and increased water stress. (FPP850)

Farming, Harvesting, Transport, Milling and Marketing Systems

Key deliverables in the R&D Plan 2007–2012 are: improved monitoring technologies and data flow between grower, harvester and miller that improve cane quality and overall efficiency of the value chain, improved processing technologies for making sugar and other products, and technologies to exploit new opportunities in the energy economy.

Improved monitoring technologies

A continuing project is utilising Real Time Kinetics technology to control harvester and haul out progression during harvest. The forward progression of the harvester will be adjusted to the load being sensed, and will in turn, control the forward position of the haul out. This project involves a unique collaboration between a grower, equipment supplier and a university, and will involve a postgraduate student project. The project will deliver triple bottom line benefits through reduced loss of cane and sugar, and reduced operator fatigue and error. (GRF001)

Improved processing technologies

To improve energy efficiency and reduce maintenance costs in factories SRDC will support a project to design and demonstrate a modification to factory rain tray condensers that would allow operation without vacuum pumps. (QUT030)

A continuing project being undertaken in collaboration with Proserpine Mill will assess the technical and economic feasibility of flash pyrolysis technology for furfural production and

benchmarking this against the Suprayield technology. (QUT015) A further project will investigate high-value products from the waste residue of the Suprayield process. (QUT016)

A new project will develop economically viable technologies to produce biofuels, platform chemicals and other value added products using thermochemical processing of bagasse. (FPP845) The project will also enhance links with R&D institutions and end user clients to ensure appropriate hydrothermal liquefaction and fractionation technologies are developed.

A new project will support the implementation of a sustainable harvest and transport system to maximise the amount of biomass collected from whole-crop harvest for the co-generation plants at Condong and Broadwater mills. The objective of this project is to improve the efficiency and cost-effectiveness of the whole-crop harvesting process, even during non-crushing season. (FPP815)

People Development Arena

Arena Outcome: *Development of individuals and networks across the sugarcane industry that enhance the capacity for continuous improvement.*

The People Development Arena recognises the need for a continued focus on improving the skills and capabilities of members of the sugarcane industry (younger and older, male and female alike), and improving the functioning of partnerships between industry, researchers, and the general community. Otherwise the opportunities provided by more technical R&D will not be realised.

Individual Capacity

Key deliverables in the R&D Plan 2007–2012 are: improved capability of individuals across the industry for positive, innovative and effective leadership; and improved capacity of individuals to change, learn, and innovate.

Improved capacity to change, learn and innovate

SRDC will continue to contribute to the Department of Agriculture, Fisheries and Forestry's *Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry*. (AFF002)

Two continuing projects are investigating novel workplace training programs for sugar transport and factory operations based on new integrated learning methodologies. This work involves collaboration between experts at QUT in interactive web-based education systems and in milling and transport engineering. One of the projects aims at developing the capacity of new supervisors to make effective decisions, with improved career prospects for supervisors. (QUT032) The second project aims at building the capacity of traffic officers to better manage transport operations. (QUT033) Both projects will contribute to handle the turnover of staff in the mills and to improve the management of transport and factory operations.

SRDC has allocated up to \$160,000 for Capacity Building Project (CBP) initiatives in 2009–10. SRDC is targeting capacity building in industry people through travel or through exposure to resource people visiting their regions, in addition to travel by researchers to workshops and conferences. SRDC provides partial funding for these activities, with partnership funding required

from those travelling, or from other organisations. Six TLOPs (now called Capacity Building Projects (CBP)) were approved in October 2008, for activities during calendar 2009. Applications for activities during 2009–10 were received in April 2009, and will be finalised by July 2009.

CSIRO researcher Dr. Graham Bonett will spend five months at the Smithsonian Tropical Research Institute (STRI), Panama, from August to December 2009. Here he will follow up on his work with CRCSIIB to determine if GM sugarcane has any altered weediness potential. He received a Queensland–Smithsonian Fellowship award of around \$25,000, which covers travel and living expenses for the researcher to access while conducting research. The expense of the research will be covered by the CRC SIIB and a SRDC Travel and Learning Opportunity Project. (CPI015) Through this research he aims at studying *S. spontaneum* in Panama and translate that understanding to our studies of potential environmental risks associated with GM sugarcane. The project is to apply learning from the study of the severe weed infestation problem in Panama to the issue of potential weediness of sugarcane and its relatives in relation to the development of genetically modified sugarcane.

SRDC will continue its postgraduate scholarship program in 2009–10. Thirteen continuing postgraduate scholars are studying in a range of disciplines including plant breeding and biotechnology, rodent pest management, soil health, environmental codes of practice, exotic pest threats, bagasse fractionation and alternative uses, and information systems. Six of these are expected to conclude in 2009–10. Two new scholarships will commence in July 2009 and a further three will be offered from January 2010. SRDC's annual Scholarships Forums in 2009 provided the participants with the opportunity to build their capacity to communicate the results of their research by learning how to write and publish a journal paper. As a result, at least five of these students will be presenting their paper at the ASSCT conference in May 2009. These forums provide a valuable opportunity for scholarship holders to interact with each other and industry leaders and build their skills. This initiative will be continued in 2009–10.

One continuing project in 2009–10 will support three engineering honours students at James Cook University to investigate novel sugarcane pre-treatment options at mills (JCU030). Exposure of honours students to real sugarcane industry issues could lead to postgraduate studies or career interest in the industry.

SRDC will continue to encourage innovation and creativity through a program of awards in 2009–10. Three national awards are offered: the SRDC Innovation Award, for an innovative solution to a complex problem which is transferable and outperforms current practice; the SRDC Research & Development Award, for a sustained contribution by an individual to research and development over the past five years; and the SRDC Service Award, for leadership by an individual in influencing innovative R&D through management, policy development or promotional activities over the past five years. These awards are presented during the ASSCT conference each year.

Social Capacity

Key deliverables in the R&D Plan 2007–2012 are: improved capacity to collaborate and innovate within the industry; improved industry structures and processes that enhance its ability to compete internationally; improved capacity to learn and innovate from people outside the industry; and improved capacity of regional industry participants to partner with researchers in identifying, addressing and delivering R&D outcomes.

Improved capacity to collaborate and innovate within and beyond the industry

Grower Group Innovation Projects (GGIPs) enable grower groups to develop and build their capability to conduct their own research and development into more profitable and environmentally sustainable sugarcane farming systems. SRDC supports the Grower Group Network, which is currently managed through a new project led by three part-time project officers, with substantial separation from direct SRDC involvement in the day-to-day management of GGIP projects. SRDC still calls for and assesses new GGIP proposals and contracts new projects, but oversight of the conduct and reporting of the projects will occur under the auspices of the new project.

A continuing project in the Mackay district is seeking to develop a more coordinated, efficient and effective service provision through collaboration and a shared vision amongst all providers of advisory services to growers (MAP 002). The project has progressed in creating a united vision for the delivery of services and has focused on assessing strategies in which the delivery of Research, Development and Extension can improve. The project will conclude in 2009–10 and during its final year will conduct two more workshops with Mackay industry representatives to further progress and document the strategies of change. The main output from this exercise will be a well documented strategy and its path to implementation to be presented to industry. It is hoped that this will improve communication, improved decision making and greater consistency in the way services are delivered in Mackay.

Allocation of SRDC investments across National and Rural R&D Priorities

Tables 4 and 5 summarise SRDC investments allocated to each of the National and Rural R&D Priorities respectively, within the three Investment Arenas. The amounts in these tables represent all proposed SRDC expenditure apart from the RCP funds.

Table 4 2009–10 Research and Development (R&D) expenditure estimates by SRDC investment arena across National Rural R&D Priority Goals (\$'000)

National Research Priorities (NRP)	An Environmentally Sustainable Australia					Promoting and Maintaining Good Health		Frontier Technologies for Building and Transforming Australian Industries			Safe-guarding Australia	Total
	A1	A2	A3	A5	A7	B3	B4	C2	C4	C5	D3	
Regional Futures	425	297	377	14	426	39	1164	174	0	397	510	3823
Emerging Technologies	110	0	113	0	325	0	470	1542	13	6	0	2579
People Development	27	0	16	0	18	0	188	15	11	761	0	1036
TOTAL	562	297	506	14	769	39	1822	1731	24	1164	510	7438

Note: Does not include RCP funding or external funding not contracted as at April 2009.

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

<p>An Environmentally Sustainable Australia</p> <p>A1: Water—a critical resource</p> <p>A2: Transforming existing industries</p> <p>A3: Overcoming soil loss, salinity and acidity</p> <p>A5: Sustainable use of Australia’s biodiversity</p> <p>A7: Responding to climate change and variability</p>	<p>Frontier Technologies for Building and Transforming Australian Industries</p> <p>C2: Frontier technologies</p> <p>C4: Smart information use</p> <p>C5: Promoting an innovation culture and economy</p>
<p>Promoting and Maintaining Good Health</p> <p>B3: Preventive healthcare</p> <p>B4: Strengthening Australia’s social and economic fabric</p>	<p>Safeguarding Australia</p> <p>D3: Protecting Australia from invasive diseases and pests</p>

Table 5 Composition of Government Research Priorities attributed to each Investment Arena (\$'000 values within Arenas) 2009–10 R&D Expenditure Estimates across Rural Research Priorities

Rural Research & Development Priorities (RRDP)	Productivity and Adding Value	Supply Chain and Markets	Natural Resource Management	Climate Variability & Climate Change	Bio-security	Supporting the Priorities: Innovation Skills	Supporting the Priorities: Technology	Total
	\$	\$	\$	\$	\$	\$	\$	\$
Regional Futures	1335	315	555	247	469	372	530	3823
Emerging Technologies	356	0	195	229	80	0	1719	2579
People Development	32	153	8	0	5	777	61	1036
TOTAL	1723	468	758	476	554	1149	2310	7438

Note: Excluding RCP funds

Attachment A

Projects and Scholarships 2009–10

Regional Futures Arena

Value Chain Integration			
Project	Title	Duration	Contact
Continuing Projects			
CGT001	Development and implementation of harvest management planning tools for the maximisation of CCS in the Tully district	Jul 06 – Feb 10	Mr Peter Sheedy
CHC002	Development of a real time information system for Clarence harvesters	Jul 06 – Apr 10	Mr Peter Rose
CRC005	Understanding the reproductive biology and ecology of sugarcane to manage the safe release of genetically modified cultivars	Jul 06 – Jan 10	Dr Graham Bonnett
CSR038	Increasing in-mill NIR effectiveness and communicating data to all sectors for improved decision making in the sugarcane value chain	Jul 06 – Sep 09	Mr John Markley
CVA003	Managing Climate Variability Program: Phase 2	Jul 07 – Sep 10	Dr Diana Saunders
JCU027	Defeating the Autumn Predictability Barrier	Jul 06 – Aug 09	Dr Yvette Everingham
OHS003	Farm Health and Safety Joint Venture: Phase 3	Mar 08 – May 12	Ms Bianca Cairns
PCS003	Sweet sorghum—Enhancing the Plane Creek value chain, capital utilisation and district viability	Jul 08 – Dec 12	Ms Jackie Richters
WS009	Assessment of regional R&D needs and opportunities	Jul 03 – Jun 11	Ms Carolyn Martin
New Projects			
FPP821	How will climate change impact climate variability and extreme events in sugarcane growing regions	Jul 09 – Oct 12	Dr Yvette Everingham

Farming and Harvesting Systems			
Project	Title	Duration	Contact
Continuing Projects			
BBF001	Pilot area-wide natural resource management group: building grower capacity to understand and better manage groundwater	Jul 06 – Aug 09	Mr Enrico Mio
BPS001	Identifying management zones within cane paddocks: an essential foundation for precision sugarcane agriculture	Jul 07 – Aug 11	Dr Ross Coventry
BSS266	Optimum canegrub management within new sustainable cropping systems	Jul 04 – Mar 10	Dr Peter Samson
BSS268	Accelerated adoption of best-practice nutrient management	Jul 04 – April 10	Dr Bernard Schroeder
BSS286	Improved sugarcane farming systems	Jul 05 – Dec 09	Dr Barry Salter
BSS294	Whole-farm planning for management of varieties to maximise productivity and reduce losses from diseases	Oct 06 – Dec 09	Mr Barry Croft
BSS296	Evaluation of genotypes for a controlled-traffic farming system	Jul 06 – Dec 11	Dr Barry Salter
BSS297	Delivering web-based irrigation management	Jul 06 – Sep 09	Mr Trevor Willcox
BSS302	Epidemiology studies into sugarcane smut	Jan 07 – May 10	Dr Robert Magarey
BSS303	Sugarcane biosecurity integrated plan	Jul 07 – Aug 10	Dr Mohamed Sallam
BSS304	Cane-grower implemented drying-off irrigation scheduling on the Tableland	Jul 07 – Mar 10	Mr David Donald
BSS306	Establishing the second crop cycle into permanent beds	Jul 07 – Dec 10	Mr Bradley Hussey
BSS318	Measurement of in-field sucrose loss by mobile refractometry	Jul 08 – May 12	Mr Cam Whiteing
CSE022	A coordinated approach to Precision Agriculture RD&E for the Australian sugar industry	Jul 08 – Sep 14	Dr Rob Bramley
DPI020	Management solutions to optimise performance of new farming systems in southern canelands	Jul 08 – Oct 12	Dr Mike Bell
FSA001	A review of opportunities to improve the design and performance of sugarcane harvesters	Jul 08 – Nov 09	Mr Rod Davis
GGP016	Tully Variety Management Group	Jul 07 – Aug 09	Mr Alf Nucifora
GGP027	Developing a sediment trapping system in the Silkwood drainage board area (SDBA)	Jul 07 – Aug 09	Mr Ian Brooks
GGP028	Facilitating enhanced peanut/sugarcane rotations by assessing and managing the issues related to growing peanuts	Sep 06 – Nov 09	Mr Don Halpin

Farming and Harvesting Systems <i>continued</i>			
Project	Title	Duration	Contact
GGP029	Mulgrave cane growers strategic grub management implementing BSES decision-making tools	Jul 07 – Jan 10	Mr Jeffrey Day
GGP030	Utilising a predictive model for the monitoring and management of canegrubs in the Mackay region by the Mount Kinchant Growers Group	Dec 07 – May 10	Mr Paul Vassallo
GGP031	Seed To Fuel: enhancing the value of rotational break crops to produce oil and bio-fuel in the Central region	Jul 07 – Aug 10	Mr John Werner
GGP034	Profits through Recycling: pilot processing of sugar industry and community by-products to improve on-farm sustainability	Jul 07 – Jan 10	Mr Neal Ross
GGP037	New Innovative Double Row Chopper System	Jul 07 – Sep 09	Mr Chris Cannavan
GGP038	Improving billet planter efficiency	Jul 07 – Mar 10	Mr Chris Shannon
MAF002	Evaluating alternative irrigation for a greener future	Jul 06 – Aug 11	Mr Chris Hesp
NFS002	An integrated approach to nut grass control	Jul 07 – Aug 10	Dr Bob Aitken
NPSI01	National Program for Sustainable Irrigation	Jul 07 – Jun 10	Ms Bianca Cairns
UNW003	Development of a constructed wetland for improving water quality in sugarcane drainage, and ensuring its community acceptance and industry adoption	Jul 04 – Aug 09	Assoc Prof Mike Melville
UQ043	Harnessing soil biology to improve the productivity of the new sugarcane farming system	Jul 07 – Aug 10	Dr Susanne Schmidt
New Projects			
FPP819	Preparing the Australian sugar industry for threats from exotic pests and diseases	Jul 09 – Oct 12	Dr Robert Magarey
FPP818	Remote-sensing-based precision agriculture tools for the Sugar Industry	Jul 09 – Aug 12	Dr Andrew Robson
FPP 844	Understanding Water Quality in sugarfarming (commissioned project)	Jul 09 – Jun 14	TBA
GGP041	Better frost tolerant varieties for NSW	Jan 09 – Dec 10	Mr Alan Munro
GGP042	Winter Soybean for biodiesel and nitrogen fixation	Jan 09 – Mar 12	Mr David Singh

Farming and Harvesting Systems <i>continued</i>			
Project	Title	Duration	Contact
GGP043	Companion planting of soybeans with sugarcane for a sustainable farming system	Jan 09 – Dec 10	Mr Jay Hubert
GGP044	Enhancing Nutrient Placement–Sub surface application of cane specific compost	Jan 09 – May 11	Ms Barbara Walker
GGP045	Developing Extended Fallow Options for the Plane Creek District	Apr 09 – Aug 11	Mr Rob Sluggett
GGP046	Investigate skip row configuration in sugar cane	Apr 09 – May 12	Mr Lee Blackburn
GGP047	Maximising Soys in Central Qld	Jan 09 – April 11	Mr Simon Mattson
GGP048	Better targeting of new cultivars for north Queensland through additional trials in four areas	Mar 09 – Dec 11	Mr Chris McClelland
GGP049	Investigating reduced nitrogen application rates for profitability and sustainability	Apr 09 – Dec 11	Mr Chris McClelland
GGP050	Improving soybean and nitrogen management in subtropical NSW cane system	Apr 09 – Dec 11	Mr Alan Munro
GGP051	Maximising Centre Pivot Efficiencies	Apr 09 – Mar 11	Mr John Fox
GGP052	The Next Step For Precision Agriculture	Apr 09 – Jan 11	Mr Tony Bujega

Note: Another new project is called “Reducing nitrous oxide emissions from sugarcane lands” funded in partnership with DAFF. It aims to start in April/May 2009 and conclude in June 2012 and is led by Dr Wang from NRW.

Transport, Milling and Marketing Systems			
Project	Title	Duration	Contact
Continuing Projects			
QUT024	Reducing transport costs through the automation of schedule generation	Feb 08 – Nov 09	Dr Geoff Kent
QUT028	Semi-automated stockpile tarping system for improved safety and fuel quality	Nov 08 – May 10	Dr Phil Hobson
TSL001	Improved management of scale formation and scale removal in the Tully evaporator station	Jul 07 – Aug 10	Mr John King
TSL002	Pelletising mill mud and ash	July 07 – Aug 10	Mr John King
LEV001	Restoring efficiency to harvested cane transport in New South Wales	Jul 07 – Nov 09	Mr Michael O’Connor

Emerging Technologies Arena

Genetics and Breeding Systems			
Project	Title	Duration	Contact
Continuing Projects			
BSS305	More crop per drop: developing water-efficient and drought tolerant sugarcane cultivars for irrigated and dryland farming	July 07 – Dec 10	Dr Prakash Lakshmanan
BSS307	Development and implementation of NIR based predictive tools to rate sugarcane varieties against smut and Fiji leaf gall	Jul 07 – Aug 10	Dr Michael O'Shea
BSS319	Maximising the rate of parental improvement in the Australian sugarcane breeding program	Jul 08 – Mar 15	Dr Xianming Wei
CRC006	Complete genome map of sugarcane	Jul 06 – Aug 09	Dr Karen Aitken
CRC008	Creating sustainable sugarcane production systems: reducing plant nitrogen demand	Sep 07 – Apr 10	Dr Susanne Schmidt
CSE014	Increased CCS, cane yield and water use efficiency by exploiting interactions between genetics and management	Jul 05 – Aug 09	Dr Geoff Inman-Bamber
CSE023	Pathways to exploiting enhanced photosynthetic efficiency for higher sucrose and biomass yield	Jul 08 – Jun 11	Dr Geoff Inman-Bamber
UQ040	Extending Sugar Booster technology into multiple sugarcane cultivars for optimal deployment by Australian industry	Jul 05 – Aug 10	Dr Robert Birch
New Projects			
FPP850	Physiology of sugarcane at elevated CO ₂ and temperatures	Jul 09 – Aug 12	Dr Geoff Inman-Bamber
FPP843	Developing sugarcane for production systems utilising total biomass	Jul 09 – Dec 13	Dr Phillip Jackson
FPP835	Developing nitrogen use efficient clones	Jul 09 – Dec 14	Dr Susanne Schmidt
FPP828	Production of novel, exogenous proteins in sugarcane	Jul 09 – Jun 12	Prof James Dale

Farming, Harvesting, Transport, Milling and Marketing Systems			
Project	Title	Duration	Contact
Continuing Projects			
GRF001	Automating harvester and haulout forward progression during harvest utilizing DGPS	Jul 07 – May 10	Mr Bryan Granshaw
QUT014	Recovery of sucrose: Part 2	Jul 06 – Feb 10	Mr Kameron Dunn
QUT015	Pilot scale development and evaluation of an improved process for furfural and fuel production from bagasse	Jan 07 – Aug 09	Dr Phil Hobson
QUT016	High value products from furfural waste residue	Jul 06 – Nov 09	Dr William Doherty
QUT030	Vacuum condenser design modification	Nov 08 – Dec 09	Mr Kameron Dunn
New Projects			
FPP845	Thermochemical biorefinery	Jul 09 – May 14	Dr Ross Broadfoot
FPP815	A successful sugar and biomass based future for the NSW sugar industry	Jul 09 – Jun 12	Mr Rick Beattie

People Development Arena

Individual Capacity			
Project	Title	Duration	Contact
Continuing Projects			
AANR01	Australian Agriculture and Natural Resource Online	Jul 07 – Sep 09	Dr Diana Saunders
AFF002	Science and Innovation Awards for Young People	Mar 03 – Apr 11	Ms Carolyn Martin
BSS326	Attend the ISSCT Entomology Workshop and model the dynamics of canegrub populations	Jan 09 – Aug 09	Dr Peter Samson
CPI015	Learning from the development of a significant weed issue, the incursion of wild sugarcane in Panama	Jan 09- Mar 10	Dr Graham Bonnett
QUT003	An integrated pest management strategy for climbing rat in the far-north Queensland sugarcane production system	Jul 05 – Jan 10	Dr Susan Fuller
QUT032	Developing a new methodology for competency based training courses for shift supervisors in sugar factories	Jul 08 – May 11	Dr Ross Broadfoot
QUT033	Improving the efficiency of traffic office operations through improved traffic officer training	Jul 08 – May 11	Dr Geoff Kent
SRD019	Building the presentation and media skills of SRDC Scholarship students	Jul 06 – Nov 10	Dr Diana Saunders
STU041	C Ngo—Molecular analysis of suckering and tillering in sugarcane	Jul 02 – Jul 09	Dr Christine Beveridge
STU052	Kylie Anderson—Invasion potential of <i>Eumetopina flavipes</i> , vector of Ramu Stunt Disease of Sugarcane	Jun 05 – Jul 09	Dr Bradley Congdon
STU053	Su Yin Tan—Studies on bagasse fractionation using ionic liquids	Mar 05 – Jul 09	Prof Doug MacFarlane
STU055	Karen Benn—The motivators and barriers to the adoption of more sustainable farming practices	Sep 05 – Jul 09	Dr Janice Elder
STU056	Kenji Osabe—Development and application of a mature stem specific promoter in sugarcane	Feb 06 – Aug 09	Dr Robert Birch

Individual Capacity <i>continued</i>			
Project	Title	Duration	Contact
STU057	Tom Rainey—Improved bagasse fibre properties for the manufacture of paper, board and composite materials	Feb 06 – Jul 09	Dr William Doherty
STU059	Anna Satje—Improving the cation retention capacity of cane-growing soils using high activity clays	Mar 06 – Sep 09	Dr Paul Nelson
STU060	Felicity Atkin—Estimates of breeding value of sugarcane clones and their impact on efficient parent management and cross pollination	Apr 07 – Apr 10	Dr Joanne Stringer
STU062	Henry Thomas—Making database application development as straight forward as building spreadsheets	Jan 07 – Feb 09	Dr John Leis
STU063	Ian O’Hara—Pretreatment of sugarcane bagasse for enzymatic hydrolysis and fermentation	Mar 08 – Jul 11	Dr Les Edye
STU064	Daniel Zamykal—Intelligent data analysis methods from effective integration of Precision Agriculture within the Australian Sugar Industry	Mar 08 – Jul 11	Dr Yvette Everingham
STU065	Milovan Bokan—Abiotic stress tolerant sugarcane: drought-proofing sugarcane with cell-death protection genes	Feb 08 – Jul 11	Dr Harjeet Khanna
New Projects			
JCU030	Pre-treatment of sugarcane	Jul 09 – May 11	Dr Philip Schneider

Social Capacity			
Project	Title	Duration	Contact
Continuing Projects			
BSS315	Conduct an R,D& E symposium in the Burdekin	Mar 08 – Aug 09	Ms Marian Davis
BSS321	Contrasting broadacre enterprise management of herbicide resistance development with that of the sugarcane industry	Jul 08 – Jul 09	Mr Barry Callow
BCA002	Performance evaluation of SRDC R&D investments	Jul 07 – Sept 12	Ms Annette Sugden
GGN001	Grower Group Network	Jul 08 – May 12	Mr Chris Aylward
MAP002	Mackay alignment of grower services (MAGS)	Jul 07 – Jan 10	Mr Burn Ashburner

Attachment B

Organisational Identifiers in Project Codes

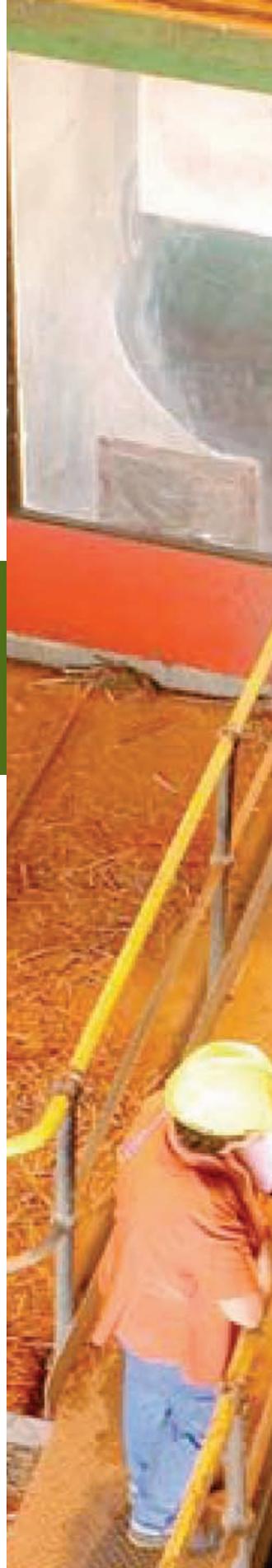
Project Codes	Organisation
AANR	Australian Agriculture and Natural Resources online
AFF	Department of Agriculture, Fisheries and Forestry
BBF	Burdekin Bowen Integrated Floodplain Management Advisory Committee
BCA	Benefit Cost Analysis
BPS	Burdekin Productivity Services
BSS	BSES Limited
CG	Queensland Canegrowers
CGH	Canegrowers Herbert River
CGT	Canegrowers Tully
CHC	Clarence Cane Harvesters
CIS	Canegrowers Isis
CMY	Canegrowers Mackay
CPI	CSIRO Plant Industry
CRC	CRC for Sugar Industry Innovation through Biotechnology
CSE	CSIRO Sustainable Ecosystems
CSR	CSR Sugar Ltd
CVA	Managing Climate Variability Program
DPI	Queensland Department of Primary Industries and Fisheries
FPP	Full Project Proposal
FSA	FSA Consulting
GGN	Grower Group Network
GGP	Grower Group Innovation Project
GRF	Granshaw Farming
IBS	Innisfail-Babinda Cane Productivity Services Limited
JCU	James Cook University
LDI	Leading Industries
LEV	Lower Empire Vale Harvesting Co-op
LWA	Land and Water Australia
MAF	Mulgrave Area Farm Integrated Action
MAP	Mackay Area Productivity Services
MUL	Mulgrave Central Mill
NCA	National Centre for Engineering in Agriculture
NFS	NSW Farming Systems Group
NPS	National Program for Sustainable Irrigation
NSC	New South Wales Sugar Milling Cooperative Ltd.
OHS	Rural R&D Corporations Farm Health & Safety Program
PCS	Plane Creek Productivity Services
QUT	Queensland University of Technology
RDA	SRDC-sponsored Awards
SRD	SRDC-Managed activities
STU	SRDC Student Scholarships
TSL	Tully Sugar Ltd
UNW	University of New South Wales
UQ	The University of Queensland
WAA	Western Australia Department of Agriculture
WS	SRDC Workshops

Attachment C

Abbreviations and Acronyms

ACFA	Australian Cane Farmers' Association Limited
ACGC	Australian Cane Growers' Council Limited
ACTFR	Australian Centre for Tropical Rainforest Research
AOP	Annual Operational Plan
ASMC	Australian Sugar Milling Council Proprietary Limited
ASSCT	Australian Society of Sugar Cane Technologists
BBIFMAC	Burdekin Basin Integrated Floodplain Management Advisory Committee
BPMS	Business Process Management System
BRIA	Burdekin River Irrigation Area
BSES	BSES Limited
CAC Act	Commonwealth Authorities and Companies Act 1997
CBP	Capacity Building Projects
CCS	Commercial Cane Sugar
CPI	Cane Productivity Initiative
CRC	Cooperative Research Centre
CRCSIIB	CRC for Sugar Industry Innovation through Biotechnology
CRRIS	Central Region Rural Innovation and Support Group
CSIRO MIS	CSIRO Mathematical and Information Sciences
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DGPS	Differential Global Positioning System
EST	Expressed Sequence Tags
GBRCA	Great Barrier Reef Marine Park Catchment Area
GGIP	Grower Group Innovation Projects
GM	Genetically Modified
HBP	Harvesting Best Practice
IPM	Integrated Pest Management
ISSCT	International Society of Sugar Cane Technologists
MRL	Maximum Residue Limit
NIR	Near Infrared
NPSI	National Program for Sustainable Irrigation
NRW	Department of Natural Resources and Water, Queensland.
NUE	Nitrogen Use Efficiency
PA	Precision Agriculture
PIERD Act	Primary Industries and Energy Research and Development Act (1989)
QDPI&F	Queensland Department of Primary Industries and Fisheries
QTL	Quantitative Trait Loci
R&D	Research and Development
R, D&E	Research, Development and Extension
RCP	Regional and Community Projects
RDC	Research and Development Corporations
RPEOI	Research Project Expression of Interest
SCAMP	Soil Capability and Management Package
SDBA	Silkwood Drainage Board Area
SHIRT	Supply and Harvester Information in Real Time
SNP	Single Nucleotide Polymorphisms
SRDC	Sugar Research and Development Corporation
SSR	Slope Stability Radar
SYDJV	Sugar Yield Decline Joint Venture
TLOP	Travel and Learning Opportunity Project (superseded by Capacity Building Projects (CBP) in 2009)





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