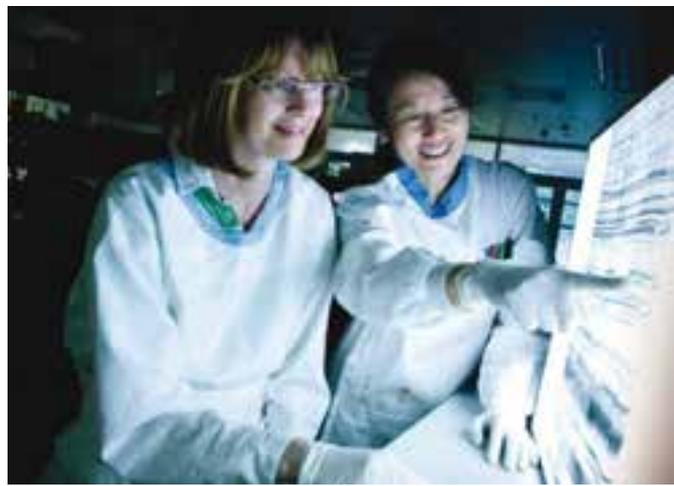


SRDC

RESEARCH, DEVELOPMENT AND EXTENSION PLAN

2012–2017



Investing in sugar research innovation



Australian Government

Sugar Research and Development Corporation

SRDC Research, Development and Extension Plan 2012–2017

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Introduction

This Plan

The Australian sugarcane industry has a long and proud history of supporting research, development and extension activities for more than a century. The industry has been well serviced since the formation of the Bureau of Sugar Experimental Stations (BSES) in 1900, Sugar Research Institute (SRI) in 1949, local Productivity (pest) Boards since 1923 and SRDC in 1990, as well as from CSIRO, State Government research agencies, industry groups and a committed university sector.

Critical and central to such a wide range of industry-based and other research groups operating in the industry is a clear and concise description of the industry's future vision and direction and the research requirements to support this future.

SRDC is a statutory authority of the Australian Government established under the *Primary Industries and Energy Research and Development (PIERD) Act 1989*. Under Section 19 of this Act, SRDC is required to prepare a Research, Development and Extension Plan for successive five-year periods. This includes a statement of the Corporation's objectives and priorities and an outline of the strategies that SRDC intends to adopt in order to achieve those objectives.

The last five year SRDC Research and Development Plan was for the period 2007–2012. In keeping with previous plans, this document has been prepared in consultation with all sectors of the industry, the Australian Government and related stakeholders. A review of the performance of SRDC against targets set in the 2007–2012 Plan has been undertaken and the key findings of this review, particularly with respect to Key Performance Indicators (KPIs), have been used in the preparation of the current document.

Mission

To foster an innovative and sustainable Australian sugarcane industry through targeted investment in research, development and extension.

Corporate Outcome

A profitable, internationally competitive and sustainable Australian sugarcane industry providing economic, environmental and social benefits for rural and regional communities through targeted investment in research and development.

Priorities

As outlined in this Plan, SRDC will work towards its Corporate Outcome during this five-year period (2012–2017), to deliver against four priorities.

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

Research, Development and Extension Plan

This Plan provides a clear framework and sets challenging targets for RD&E for the Australian sugarcane industry during 2012–2017.

This Plan presents a strategic view of the needs and opportunities for RD&E and outlines an investment strategy to achieve outcomes that meet the expectations of industry, government and the community.

BSES Research Officer in Entomology, Dr Nader Sallam inspects his collection of greyback cane grubs (Dermolepida albohirtum) stored in his laboratory at the BSES research station in Meringa, North Queensland.



Lawrence Di Bella of Terrain NRM was awarded SRDC's Project Supporter Award as part of the 2012 Grower Innovation Awards.

Partnerships

Industry-wide partnerships and research collaboration will be the key to the success of this Plan. It is only through partnerships between industry participants, universities, government, rural communities, other Rural Research and Development Corporations, and researchers that SRDC will achieve its intended outcomes.

SRDC works in a unique and highly successful partnership between the Australian sugarcane industry and the Australian Government. SRDC is an RD&E investment body and partner, investing funds provided by both industry and government and seeking co-investment with industry and RD&E partners to deliver beneficial outcomes.

Core Business Objectives

SRDC's core business objectives are to seek out and invest in strategic Research, Development and Extension (RD&E) which will underpin an innovative and sustainable Australian sugarcane industry characterised by:

- World-class farming, harvesting, transport and milling practices
- Average cane yields in excess of 100 tonnes per hectare
- Being capable of reliably exceeding 36 million tonnes of sugarcane per annum
- Providing leadership in environmental stewardship and social sustainability
- Extending the value of the sugarcane plant.

A Vision for the Future

Industry Overview

Sugar is a nationally significant rural commodity contributing an annual gross value of production of up to \$1.5 billion to the economy. Growing sugarcane and the associated processing into raw sugar is one of Australia's largest and most important rural industries and contributes significantly to the economy of many coastal communities in Queensland and northern New South Wales.

In the period 2002–2009, around 3,900 farming enterprises supplied, on average, 35 million tonnes of sugarcane to 24 sugar mills. Sole proprietors or family partnerships own most sugarcane farms, although corporate ownership of farms is increasing.

Australia is a low-cost producer and a major exporter of raw sugar. The Australian sugarcane industry is world renowned for having efficient, innovative producers with demonstrated capacity to respond to changing conditions. On-farm productivity is among the best in the world. The environmental report card for the sugarcane industry is positive with a number of continuous improvement strategies in place (both in the field and in sugar mills).

As most Australian sugar is exported, industry success has been built on, and continues to require, world's best practice in production, handling and marketing, as well as a reputation for quality, supply reliability and service. At the farm gate, yields have levelled out over the last 10 years, mainly reflecting the impact of inclement weather and major disease. Despite this, the Australian sugar cane industry has maintained export competitiveness via innovation, particularly through mechanisation, new farming practices, varietal improvement and, more recently, diversification.

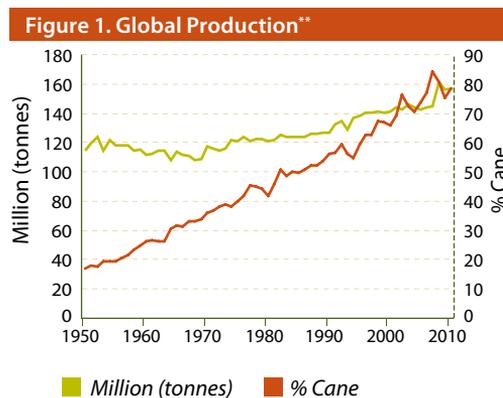
The long-term sustainability of the Australian sugarcane industry has depended on continued high-quality raw sugar production. In recent years the industry has also had the potential to capitalise on the energy value of bagasse and other sugarcane products.

In addition to innovative improvements in sugarcane growing, harvesting, milling and sugar manufacturing, the industry has supported initiatives that identify and foster innovation and diversification opportunities to provide a forward-looking and 'broader' based sugarcane industry.

While ethanol fuel, electricity co-generation and other products currently form a small part of industry production, these offer potential for industry diversification and profitability while achieving positive environmental outcomes.

Current Global Status

Global sugar production is expected to continue to expand in line with 2011–2012 increases, which are forecast to rise to 168 million tonnes, up 4% from the previous year (see Figure 1 for trend to 2010).



** Source: F.O. Licht's International Sugar and Sweetener Report.

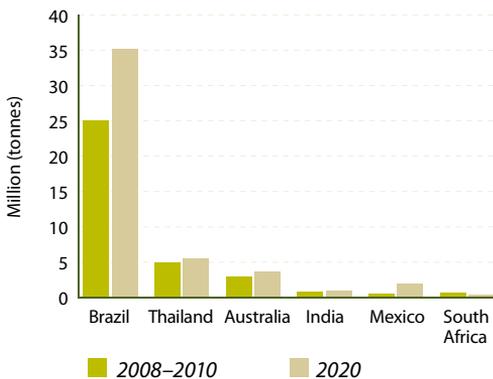
Production levels are expected to be 10% lower in Brazil in 2012–2013; however, this has been offset by increases in the European Union (EU), Russia and Thailand. Poor growing conditions adversely affected production in Brazil during 2011–2012. Increased production area combined with favourable weather conditions and better than expected yields resulted in Thailand's record production in 2011–2012. Measures by the European Commission to encourage production and stimulate demand from processors are expected to result in high yields and record EU production.

Global consumption is also set to continue to increase. During the 2000s, global consumption rose at a steady rate of 2.5% per year and is forecast at a record 159 million tonnes in 2011–2012. Increased consumption in Asia (particularly India and China) is expected to drive continuation of this trend.

Despite its low per capita consumption given its large population, China is still the second biggest sugar-consuming country in Asia behind India, consuming 15 million tonnes of sugar per year. As it does not produce enough sugar domestically to supply its consumers, China is expected to become the biggest importer over the next decade, surpassing the EU and USA.

The majority of imported sugar already goes to developing countries rather than developed countries. Trends in future global exports are set out in Figure 2.

Figure 2. Predicted sugar exports**



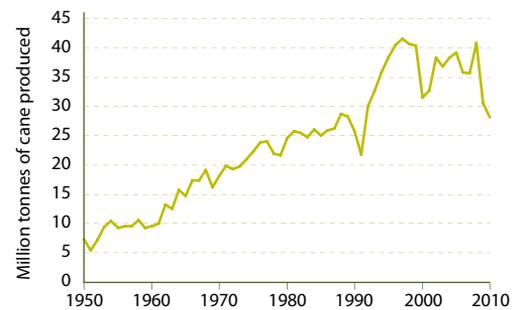
** Source: F.O. Licht's International Sugar and Sweetener Report.

As increasing amounts of sugarcane is grown in Brazil, many sugar processors and traders have invested in Brazilian-based production facilities. More than 10% of Brazilian cane output is estimated to be controlled by foreign investors. This foreign investment continues to be driven by a significant interest in using sugarcane to produce biofuel as a transport fuel as well as in industrial manufacturing based on sugar and biomass carbon. Around 20% of global production is currently used for fuel sugar rather than food sugar and this trend is expected to continue.

Domestic Status

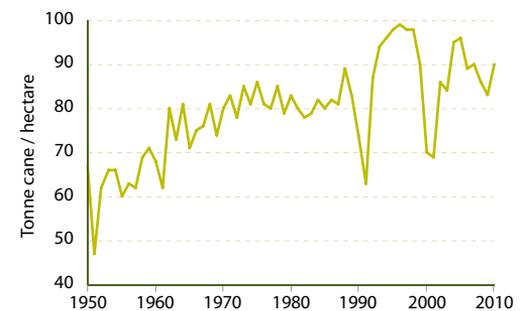
The industry in Australia will produce about 4.2 million tonnes of sugar in 2011–2012 (see Figure 3 and Figure 4 for trends to 2010), the majority of which will be exported. Changes in global sugar prices (see Figure 5), exchange rates and the volume of sugar production drive industry revenue. There has been a decrease in sugarcane production over recent years associated with adverse weather conditions, the outbreak of sugarcane smut and increased competition for land for cane growing due to urban growth and alternative crops.

Figure 3. Australian cane production*



* BSES Mill statistics

Figure 4. Australian cane yields*



* BSES Mill statistics

Domestically, the industry is responding to government environmental policy initiatives. Government-led activities include programs such as the Reef Rescue Plan (a five year plan commenced in 2008) which was implemented to reduce the risk of sediment, nutrients and herbicides leaving coastal farming operations and affecting the health of the Great Barrier Reef.

The Australian Government's renewable energy target saw a renewed interest in sugarcane co-generation operations. Recent challenges and changes to the accompanying legislation have severely limited the adoption of the cogeneration plans of many of the milling companies. Public pressure is expected to continue to demand that Government policies protect the country's natural resources. Research and development are increasingly important to help growers and millers adapt to, comply with, and realise opportunities arising from changes to government consideration of issues such as climate change and carbon pricing.

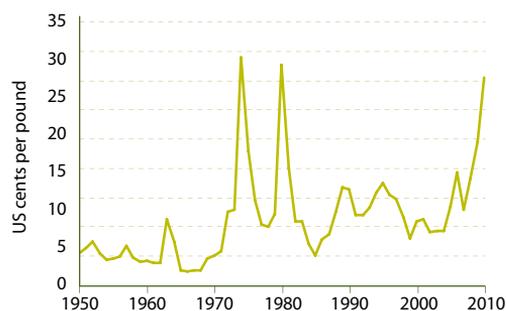
An opportunity for the industry lies with diversification into other sugarcane products and complementary uses of sugarcane land. Diversification opens opportunities for exploring new markets and new products. The Australian sugarcane industry is already producing raw and refined sugars, ethanol, molasses, liquid fertiliser, compost, fodder, landscape mulch, and co-generating electricity from the sugarcane crop. The industry is evaluating opportunities for the use of new production systems for paper products, bioplastics, nutraceutical compounds, value-added foods, industrial proteins and high fibre varieties for biomass production as well as some of the more specialised biofuels for aviation and maritime application. Some of these opportunities are likely to take many years to develop and implement.

The industry faces many challenges and opportunities, which will need R&D and other solutions. Some of these include:

- Pricing structures and efficiencies affecting farm viability
 - Margin pressure favouring larger farms, corporate farming and increased sugarcane farming by mill owners (vertical integration) to manage costs
 - Preparedness for an epidemic of existing diseases such as Orange Rust
 - Production losses associated with transition from susceptible to resistant cultivars following the incursion of exotic diseases
 - Continued investment in the development of genetically modified (GM) sugarcane varieties
 - Urban encroachment pressure on sugarcane land in popular coastal regions
- Challenges and opportunities presented by climate variability
 - Opportunities for diversification with co-generation and specialty fuels
 - Changes in mill ownership and restructuring of operations challenges associated with efficient mechanised harvester operations
 - Declining numbers of researchers committed to sugar industry research and development
 - Environmental impacts of industry operations, particularly water use and quality, which are paramount industry concerns
 - Socio-economic factors such as grower age, succession planning and small farm size
 - Shortage of suitably qualified labour in the agricultural and milling sectors, exacerbated by the attraction of these skilled staff to positions in the mining industry.

SRDC recognises that this Plan has been developed through a period of significant change in the RD&E sector of the industry. Industry groups led by the Australian Sugar Industry Alliance (ASA) have commenced a series of consultancies and programs to restructure the total industry investment and infrastructure providing RD&E for the industry. This Plan has been developed on the basis that until such time as the outcome of the industry processes are finalised and agreed to, SRDC will require an ongoing Strategic Plan for the period commencing 1 July 2012.

Figure 5. Normalised global sugar price**



** Source: F.O. Licht's International Sugar and Sweetener Report.

The Future

The volatility of the global sugar price (see Figure 5) highlights the challenges facing the Australian sugar industry. Prices have remained marginal for many years with an occasional 'spike' in prices often associated with production/demand imbalances. Recent years have seen an increase in pricing which may also reflect changing global dynamics for carbohydrates and starches as part of the emerging biofuels industry.

For Australia, however, less than favourable production conditions have offset these high prices. Cash flow challenges, adverse weather across the industry and the attraction of alternative crops with higher marginal returns have resulted in a decline in production. In recent times, inputs (irrigation and fertiliser in particular) have been applied at appropriate levels to achieve optimum economic returns to the industry.

This background of generally poor production and sometimes low prices has led to a shorter term focus for the future than has been experienced in preparing most of the earlier RD&E Plans. To ensure future viability, industry productivity needs to return to the higher levels of the late 1990s, of 40 million tonnes of cane annually, and productivity of 95–100 tonnes of cane per hectare (see Figure 4).

Production technologies for the milling and growing sectors exist to support this level of production. Much RD&E, however, is synonymous with a significant risk and long development period (often of the order of 10 years or more). While immediate challenges to the industry will focus on the return to earlier production levels, there is recognition that, in order to remain at the forefront of technology, the investment in RD&E must continue for the medium to long term. It is important now more than ever despite the risks usually associated with a shorter timeframe. External analyses of the SRDC project portfolio carried out by AgTrans and PwC have shown an excellent return on investment for previous funding decisions.

Global markets for rural commodities have changed dramatically over the last five years, particularly where there is competition between the food and energy value of the commodities themselves. For sugarcane this challenge presents an enormous opportunity. The marketplace is no longer simply focusing on sucrose production from sugarcane.

Industrial and energy manufacturers are now investing in bio-based production systems for the production of their future supply of traditional building and industrial materials.

RD&E agendas must focus on not only the more efficient and effective cultivation and processing of the crop for traditional markets, but also on future opportunities for alternative uses of the Australian sugarcane plant. Many of these new opportunities will be niche market focused.

While large scale production options will be available where economies of scale allow (for instance, greater than 5 million tonnes of cane equivalents), the more likely market niche of relevance to the Australian sugarcane industry remains in the medium to high priced markets applicable to a small or medium mill area.

Current and emerging opportunities to partner with the Australian industry sectors support this concept. Many large industrial manufacturers have established relationships with the industry in high production areas such as Brazil for the production of basic commodities such as polyethylene from sugar. Australia, on the other hand, provides a stable political, financial and intellectual property environment in which these smaller business platforms would be appropriate for more niche products.

Whatever the outcome of this current trend in industrial manufacturing, sugarcane production and processing techniques must continue to improve in order to maintain the future viability of the industry. Without this, value adding opportunities will not be viable. To this end SRDC will continue to invest in innovative RD&E to ensure increased competitiveness of the industry and maintenance of its position in the international market.

Industry and Government Priorities

Sources of Advice on Priorities

The *Primary Industries and Energy Research and Development Act 1989* (the PIERD Act) requires SRDC to investigate and evaluate the requirements of the sugarcane industry for RD&E and on the basis of that to prepare an RD&E Plan, and review and revise that Plan as necessary.

Accordingly, SRDC takes account of the priorities, needs, and opinions on RD&E of the Australian Government, the sugarcane industry, and other interested parties – all of whom have been consulted extensively at various stages during the development of this Plan.

Three major groups have provided input into the planning process:

1. The Australian Government has articulated its views in the National Research Priorities through *Powering Ideas: An Innovation Agenda for the 21st Century (2009)*, the more specific Research Priorities for Rural R&D (2007), the National Primary Industries Research, Development and Extension (RD&E) Framework (2008) and the National Sugarcane Industry Research, Development and Extension Strategy (2010).
2. Representative Bodies specifically designated by the Australian Government for SRDC, namely: the Australian Cane Farmers' Association Ltd (ACFA), the Australian Cane Growers' Council Ltd (ACGC), and the Australian Sugar Milling Council Proprietary Ltd (ASMC). Input from the Australian Sugar Alliance (ASA) has also been taken into account in the development of this document.
3. Industry participants, government and research organisations including individuals and organisations at a national, regional and mill area level, concerned with growing, harvesting, transporting, milling and marketing. This Plan has also been informed by individual Regional Plans developed as part of the Sugar Industry Reform Program (see further discussion of ASA led processes outlined at page 10).

SRDC has captured input from this diverse group through annual research workshops held in each region during 2011. At these workshops, SRDC

reports on significant RD&E outcomes relevant to each region and seeks advice and feedback on its priorities and performance.

National Sugarcane Industry RD&E Strategy

In 2008, the National Primary Industries Research, Development and Extension (RD&E) Framework was endorsed through the Primary Industries Ministerial Council (PIMC) by the Commonwealth and all state governments. This framework supports the development of 14 commodity and seven cross-industry RD&E strategies. The National Sugarcane Industry RD&E Strategy is part of this framework and sets the vision for an RD&E Strategy for the sugarcane industry, which was finalised through an industry consultation process in 2010. This strategy aims to:

- Improve the focus, cost efficiency and effectiveness of sugarcane industry RD&E
- Create a system of sugarcane industry RD&E that better integrates the priorities of industry and industry organisations, all levels of government and RD&E providers, for industry benefit
- Enhance RD&E capability through increased collaboration, specialisation and critical mass
- Provide an RD&E system that is responsive and accountable to industry needs and which improves industry sustainability and competitiveness.

Ultimately, the Strategy aims to continue the sugarcane industry's position as a dynamic and productive sector, supporting rural communities as well as state and national economies. It is directed towards providing a national RD&E system that supports industry priorities to maximise economic, environmental and social outcomes. The Australian Sugar Industry Alliance (ASA) is to lead the implementation of the Strategy in conjunction with the Queensland Government and SRDC, with additional representation from other industry organisations via a research committee (established upon acceptance of this strategy).

The rationale for the National Sugarcane Industry RD&E Strategy is to:

- Determine the RD&E strategic objectives that will deliver the long-term vision for the sugarcane industry
- Provide a mechanism for industry, research providers, research funders and research deliverers to interact to optimise the effort in RD&E
- Determine the current national RD&E capability for sugarcane, assess future capability requirements and identify future capability gaps
- Provide accountability to industry for RD&E outcomes that support industry development.

Flowing from this National Sugarcane Industry RD&E Strategy will be an implementation process supported by operational plans and agreements. These subsidiary plans will address issues of industry and government cooperation and collaboration, information sharing, funding, access to capability and reporting.

An agreed process for industry-led RD&E priority setting and resource allocation is presented as part of the strategy. The processes outlined in the strategy will provide improved mechanisms for information sharing and collaborative investment on behalf of industry, government and RD&E providers.

Many of the National Sugarcane Industry RD&E Strategy's objectives are currently addressed through existing cooperative and independent research activities.

Industry research is largely concentrated in Queensland due to the nature of the sugarcane crop, and principally delivered by two industry research organisations (BSES Limited and Sugar Research Institute) with well-defined areas of expertise.

There are good linkages between industry stakeholders, customers and research organisations through ownership and consultation, and these organisations link with other research providers in seeking to make RD&E more effective.

Australian Sugar Industry Alliance

In January 2012 the Australian Sugar Industry Alliance (ASA) led by the Australian Sugar Milling Council and CANEGROWERS, released a proposal recommending the need for major sugar industry RD&E reform, changes to research funding, structures, and operations commencing in 2013–2014.

ASA proposed that processes will need to be developed for incorporating industry priorities into RD&E planning, iterative consideration of proposals including longer term investments, and extending and branding research outcomes. ASA also provided a weighted set of priorities against which future investments should be selected.

Key Issues

ASA anticipates research organisations expending sugar industry funds will develop criteria and measures that ensure alignment of programs and projects with these priorities. Specifically, ASA is seeking to have a higher proportion of larger projects, and targeting step change results, rather than numerous smaller incremental change projects.

The ASA document suggests that the existing RD&E resources are spread too widely and the key issues for investment should be focused on inventive programs and projects designed by researchers to address three major, linked issues (with proposed investment proportions in brackets), namely

1. **Industry growth**, particularly the need to stop decline and build to 36 million tonnes pa (40%)
2. **Cost and profitability** of sugarcane and sugar production across different farm types and mills (35–40%)
3. **Environmental and regulatory pressures** including water (15–20%).

To further sharpen the focus of RD&E, ASA is seeking to place a low priority (0–5%) on use of industry funds for research into diversification of cane uses and new products between 2011–2014.

Research Priorities identified by ASA

ASA believes sufficient funding exists outside the industry for commercial RD&E. Eight 'Types of Research' have been identified and they propose a proportional commitment to each of these. In general, these represent most of the ten themes originally identified in the industry processes of the National Sugarcane Industry RD&E Strategy.

National Sugarcane Industry RD&E Strategy		
Themes	Definition of themes	Percentage
Variety development	Delivery of new more productive varieties to the industry with appropriate disease and insect resistance, milling and sugar quality and usages such as biomass	25%
Plant breeding (molecular)	Plant breeding research including DNA markers, GM technology, varieties, seed and tissue propagation	20%
Biosecurity	Breeding trials to guard against disease, disease study, quarantine	5–10%
Environment, water and farming systems	Sustainable cane production, efficient cane production systems, innovative ways of facilitating RD&E adoption on-farm	25%
Milling and supply	Milling processes and systems, transport, harvesting, supply arrangements – including quality	10–15%
Social, people and adoption	Development of individuals, networks and social capacity, industry, regions and communities	10%
Analytical technologies	Chemical analysis of sugar and other cane products e.g. NIR	0–5%
Alternative cane uses, biomass by-products	Investigation of alternative uses for sugarcane biomass including fuel, by-products from cane and other value added products	0–5%

ASA proposes that the industry's RD&E strategy and funding usage be aligned with priorities to make a difference to industry prospects (2011–2014). The ASA statement "expects 80% of projects to deliver forecast results". ASA is seeking increased performance, greater accountability and a more rigorous evaluation of research. This represents a significant challenge to the RD&E providers given the associated ASA expectation of "seeking to have a higher proportion of larger projects, and targeting step change results, rather than numerous smaller incremental change projects".

Stakeholder Engagement Process

In 2011, SRDC conducted (through a third party consultant) a stakeholder engagement survey and analysis to better understand issues associated with

the current status of the industry, identify RD&E priorities and gain feedback on the performance and operations of SRDC. Parts of the research asked stakeholders to rate the value, relevance and financial importance of priorities identified in the National Sugarcane Industry RD&E Strategy.

Regional Consultation Meetings

Further more, between October and December 2011, the SRDC Board and staff met with regional industry grower and miller groups in an open forum to seek comments and opinions regarding the industry's future direction, current challenges and future opportunities, as well as to invite input to the total performance of SRDC. This latter process involved 16 meetings and 150 participants from Mossman to Broadwater, as well as meetings with the industry Representative Bodies in Brisbane.

Research priorities identified during regional consultation meetings were:

- Cane breeding and variety improvements
- Harvesting – costs and effectiveness
- GM technology
- Environmental sustainability and climate change
- Skilled people to address labour shortages across on-farm and research institutions
- Milling efficiencies
- Raw sugar quality.

Commitment to Innovation

Innovation is increasingly regarded as having the capacity to drive industry productivity gains. It can increase productivity through the development of higher value products, improved production and processing schemes or more efficient and effective organisations and market development. Recently, the Productivity Commission identified that innovation was associated with a 62% increase in benefit to Australian industry over the long term.

Kelly¹ noted that innovation can drive productivity growth in two ways; firstly by transforming existing industries to cope with competitive pressures and take advantage of new markets, and secondly through the generation of new business opportunities and creation of new industries.

These concepts and ideas are just as relevant to the future of the Australian sugarcane industry as they were when the industry commenced its initial investment in RD&E more than a century ago. With the expanding and changing global business pressures and opportunities faced by today's sugarcane industry, there remains a demand to maintain an awareness of innovation, not just in its traditional business arenas but to become more knowledge-intensive and able to quickly identify and leverage new sources of competitive advantage. The demand is for the industry to be not only technically sophisticated but to employ best practice management techniques and have access to appropriately skilled personnel.

Research Agenda

Research is a process intended to create new or improved technology that can provide a competitive advantage at the business, industry, or national level. While the rewards can be very high, the processes involved are often complex and can be extremely risky. Research projects may fail to provide the expected results and may produce unexpected results.

The objective of academic and institutional research is to obtain new knowledge, which may or may not be immediately applied to practical uses. In contrast, the objective of commercial research is to obtain new knowledge, applicable to the commercial business need that eventually will result in new or improved products, processes, systems, or services that can increase the industry's value.

Three types of research, basic research, applied research, and development, are often discussed in the literature. Basic research has a fuller knowledge or understanding of the subject under study, rather than a practical application of it. As applied to the commercial sector, basic research is defined as research that advances scientific knowledge but does not have specific commercial objectives, although such investigation may be in fields of present or potential interest to the industry.

Applied research is directed towards gaining knowledge or understanding necessary for determining the means by which a recognised and specific need may be met. In industry, applied research includes investigations directed to the discovery of new knowledge having specific commercial objectives with respect to products, processes, or services.

Development is the systematic utilisation of the knowledge or understanding gained from research toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes.

All three types of research are appropriate to the future needs of the Australian sugar industry and should form a legitimate base of the SRDC investment portfolio.

¹ Kelly, P. (2012) *Productivity growth through innovation*, FOCUS #170, February 2012, pp15 – 16.

Corporate Strategies

SRDC's core business objectives are to seek out and invest in strategic Research, Development and Extension (RD&E) which will underpin an innovative and sustainable Australian sugarcane industry.

These objectives are characterised by:

- World-class farming, harvesting, transport and milling practices
- Average cane yields in excess of 100 tonnes per hectare
- Being capable of reliably exceeding 36 million tonnes of sugarcane per annum
- Providing leadership in environmental stewardship and social sustainability
- Extending the value of the sugarcane plant.

A series of strategies have been identified to underpin these objectives.

Strategy 1

Support, coordinate and lead the implementation of the National Sugarcane Industry RD&E Strategy

Critical to the coordination and focus of Sugarcane RD&E is the recently prepared and industry supported National Sugarcane Industry RD&E Strategy.

As a major player in the industry's RD&E sector, SRDC makes a significant contribution to the strategy, its implementation and ongoing review. Through support and commitment to the strategy, the industry has the opportunity to ensure all RD&E providers to the industry have a common platform for collaboration and partnerships to achieve the overall RD&E goals and vision for the industry.

Critical Success Factors

- Focused, efficient and effective sugarcane industry RD&E
- Co-ordinated and integrated priorities for the growing, harvesting, milling, government and RD&E sectors delivering industry and social benefits
- Enhanced RD&E capability through research provider collaboration and specialisation
- An RD&E portfolio balance that manages the level of investments in strategic and applied RD&E
- An RD&E system that is responsive and accountable to industry and government needs while improving the industry's competitiveness

Outcome

- Stakeholders support and actively implement the National Sugarcane Industry RD&E Strategy through mutually agreed roles to efficiently and effectively utilise RD&E investment and capability to achieve the strategy's objectives and outcomes.

Deliverables and Measures of Success

- SRDC convenes and contributes to meetings to agree to and implement the National Sugarcane Industry RD&E Strategy.
- SRDC consults Representative Bodies and Sugarcane RD&E Committee members (individually and collectively) each year to develop the Annual Operational Plan.
- SRDC annually demonstrates alignment with the National Sugarcane Industry RD&E Strategy through reporting the projects and proportion of investments that contribute to the national strategy's goals.

Strategy 2

Grow and leverage the total investment in sugarcane RD&E

The Welsman Report² cites the level of commitment of RD&E to sugar industry issues as \$58 million per annum in 2009–10. This comprises levies and fees to traditional sugarcane industry institutions, funding from Commonwealth and State Governments as well as private investments from industry groups. This also included investment in a Cooperative Research Centre whose term has now concluded.

SRDC is committed to supporting the continued commitment of an appropriate level of funding to support the industry's needs and future opportunities.

Critical Success Factors

- Funds available from other government programs
- International RD&E collaboration on priority issues occurring
- Increased private investment in sugarcane RD&E is facilitated
- RD&E outputs suitable for commercialization by appropriate parties
- Returns from RD&E investment demonstrated to industry and investors
- Increased collaboration with other RDCs.

Deliverables and Measures of Success

- Achieve an SRDC RD&E investment greater than \$15 million per annum by 2017.

Outcome

- Total RD&E investment by National Sugarcane Industry RD&E Strategy stakeholders greater than \$60 million per annum by 2017.

² Welsman, S J *Australian Sugar Industry RD&E Reform Report. Reform proposals: Implementation points (September 2011)* see www.canegrowers.com.au/icms_docs/110715_RDE_Reform_Welsman_Report.pdf

Strategy 3

Engage effectively with our customers and stakeholders

To provide an environment, processes and opportunities to ensure that investment in RD&E reflects the needs of the industry, customers and stakeholders into the future – SRDC will maintain a clear focus on inclusive, transparent and balanced approaches to engagement with customers and stakeholders.

Effective communication to all industry and government groups, RD&E providers and the community is critical to the ultimate success of SRDC. It is essential that research outcomes and information about new technology relevant to the sugar industry, and the outputs and benefits of the RD&E investment portfolio are communicated to appropriate groups.

Effective communication is paramount to maintaining the relevance and industry support of SRDC, considering such a wide industry platform and the large number of current and potential RD&E providers relevant to the current and future needs of the industry. Each customer or stakeholder audience requires a unique and appropriate method of engagement. SRDC will work with each audience to establish appropriate channels of communication and protocols of engagement.

Critical Success Factors

a) Growers and Millers:

- Clear demonstration of relevance of RD&E and its outputs and how it benefits operations and profitability/sustainability
- Active involvement in RD&E priority setting (as for industry organisations)
- Effective communication.

b) Industry Organisations:

- Active involvement in RD&E priority setting
- RD&E programs deliver against industry research priorities
- Effective communication providing feedback on the performance of RD&E programs ensuring transparency and accountability
- Support from industry organisations to communicate RD&E outcomes to their members.

c) Australian Government:

- RD&E programs deliver against the National Research Priorities and Rural Research Priorities
- Delivery of the National Sugarcane Industry RD&E Strategy
- Financial and corporate governance and risk management requirements met
- Cross-sectoral investment opportunities recognised
- Effective communication providing feedback on SRDC performance.

d) RD&E Partners:

- Implementation of the National Sugarcane Industry RD&E Strategy includes an effective mix of RD&E partners, local and international
- 'Best Operating Practice' in investment processes aligned with the requirements of the National Audit Office and the Department of Finance and Deregulation is achieved
- Effective communication to assist in the delivery of research priorities and research outcomes
- Operating efficiencies that deliver mutual benefit with RD&E partners are pursued.

Deliverables and Measures of Success

- Number of information products (electronic and printed) and services (presentations and meetings) provided to industry on RD&E findings and benefits
- Number of presentations made and meetings held with industry and government to inform the development and implementation of the SRDC RD&E Plan and Annual Operational Plan.

Outcome

- Proportion of industry levy payers accessing information products (electronic and printed) and services (presentations and meetings) provided to industry on RD&E findings and benefits
- Proportion of industry and government stakeholders attending presentations made and meetings to inform the development and implementation of the RD&E Plan and Annual Operational Plan
- A 15% increase in the Customer and Stakeholder Survey average satisfaction measure by 2017.

CSIRO Research Technician Dr Donna Glassop investigates sugarcane growing in a controlled environment.



Strategy 4

Improve operational efficiencies

Stakeholders expect SRDC to be operationally effective and efficient. SRDC respects the governance responsibilities placed upon it.

The operational efficiencies must not only be relevant to the statutory requirements placed on the organisation but must match the environment of challenge, risk and operational variables associated with the operation of SRDC's portfolio of projects. A range of administrative and structural systems based on currently accepted Best Practice Concepts are available for the effective operation of SRDC.

Critical Success Factors

- 'Best Operating Practice' in the design, governance, risk management and execution of RD&E programs as defined by the Australian National Audit Office (ANAO), Department of Finance and Deregulation (DOFD) and Department of Agriculture Fisheries and Forestry (DAFF) achieved
- Development and adoption of standardised economic tools in collaboration with other RDCs that demonstrate the predicted and actual returns of RD&E investments, risk profile and probability of success
- Potential improvements to further enhance the delivery of RD&E explored.

Outcome

- Non-project RD&E expenditure equivalent to average non-project RD&E expenditure of all similarly sized RDCs.

Deliverables and Measures of Success

Support non-project RD&E expenditure equivalent to average non-project expenditure of all Rural Research and Development Corporations (percentage below 2011–2012 average).

Strategy 5

Targeted and strategic SRDC investment portfolio

Based on priorities from our major stakeholders, SRDC has identified four programs to categorise SRDC's project investments linked to government and industry priorities.

PROGRAM 1: Growing the Crop

PROGRAM 2: Milling the Crop

PROGRAM 3: Sustaining the Environment

PROGRAM 4: Skills and Capabilities

Critical Success Factors

- Annual total RD&E investment (total expenditure less non-RD&E project expenditure) is within the following ranges:
 - Research (initiation and development of hypotheses and testing of these) 35–45%
 - Development(adaptation of research into a commercial product or service) 35–45%
 - Extension (ultimate marketing of the product or service to the customer of end user) 15–25%.
- Annual total program investment (total expenditure less non-RD&E project expenditure) is within the following ranges:
 - Growing the Crop program 35–45%
 - Milling the Crop program 25–35%
 - Sustaining the Environment program 10–20%
 - Skills and Capabilities program 10–20%.

Deliverables and Measures of Success

- Annual total program investment (total expenditure less non-RD&E project expenditure) is within ranges established in the five year plan
- Establish a cost-effective and repeatable investment portfolio assessment tool to ensure funding decisions for 2013–14 and onwards deliver a greater than 4:1 average benefit cost ratio
- Determine the benefit:cost ratio of three clusters of significant projects each year using methodologies set out in the Council of Rural RDC Evaluation Guidelines.

Outcome

- A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane
- A profitable milling sector utilising new and improved technologies and processes
- Coordinate, facilitate and extend, as appropriate, existing environmental stewardship programs
- An industry committed to a culture of education, learning and innovation.



Aligning RD&E Priorities to SRDC's Program

Programs are underpinned by SRDC's commitment to cross value chain, cross sectoral, public good and collaborative investments. Tables 1–4 illustrate the relationship of SRDC arenas linked to National RD&E and Rural RD&E priorities identified by the Australian Government, and priorities identified by industry in the National Sugarcane Industry RD&E Strategy and by the ASA.

Table 1. SRDC Program linked to National research priorities

NATIONAL research priorities	SRDC Programs			
	Growing	Milling	Environment	Capabilities
An environmentally sustainable Australia	✓	✓	✓	✓
Promoting and maintaining good health	✓	✓	✓	✓
Safeguarding Australia	✓		✓	✓
Frontier technologies for building and transforming Australian industries	✓	✓	✓	

Table 2. SRDC Program linked to Rural Research and Development priorities

RURAL research and development priorities	SRDC Programs			
	Growing	Milling	Environment	Capabilities
Productivity and adding value	✓	✓	✓	✓
Supply chain and markets	✓	✓	✓	✓
Natural resource management	✓	✓	✓	✓
Climate variability and climate change	✓	✓	✓	✓
Biosecurity	✓		✓	✓
Innovation skills	✓	✓	✓	✓
Technology	✓	✓	✓	✓

University of Queensland Professor Susanne Schmidt and PhD student Prapat Punpee observe sugarcane plants in the University of Queensland greenhouse.

Table 3. SRDC Program linked to National sugarcane Industry RD&E strategy themes

NATIONAL sugarcane industry RD&E strategy themes	SRDC Programs			
	Growing	Milling	Environment	Capabilities
Improving farming, harvesting and milling systems	✓	✓	✓	✓
Variety development	✓		✓	✓
Biosecurity	✓		✓	✓
Resource input efficiency	✓	✓	✓	✓
Adopting best practice	✓	✓	✓	✓
Enhancing environmental and social performance	✓	✓	✓	✓
Value chain efficiency	✓	✓	✓	✓
Alternative and complementary products from existing production systems	✓	✓	✓	✓
Analysis and benchmarking of business practices	✓	✓	✓	✓
Adaptability and risk management	✓	✓	✓	✓

Table 4. SRDC Program linked to Australian Sugar Industry Alliance Priorities

Australian Sugar Industry Alliance Priorities	SRDC Programs			
	Growing	Milling	Environment	Capabilities
Variety improvement Delivery of new more productive varieties to the industry with appropriate disease and insect resistance, milling and sugar quality and usages such as biomass	✓		✓	✓
Plant breeding (molecular) Plant breeding research including DNA markers, GM technology, varieties, seed and tissue propagation	✓		✓	✓
Biosecurity Breeding trials for disease, disease study, quarantine	✓		✓	✓
Environment, water and farming systems Sustainable cane production, future cane production systems, and innovative ways of facilitating R&D adoption on-farm	✓		✓	✓
Milling and supply Milling processes and systems, transport, harvesting, supply arrangements – including quality	✓	✓		✓
Social, people and adoption Development of individuals, networks and social capacity, industry, regions and communities	✓	✓	✓	✓
Analytical technologies Chemical analysis of sugar and other cane products e.g. NIR		✓	✓	✓
Alternative cane uses, biomass by-products Investigation of alternative uses for sugarcane biomass including fuel, by-products from cane and other value added products	✓	✓	✓	✓

RD&E Investment Program

Within the budget available each year, SRDC will focus investments in major areas of significance as outlined in this section. In general, these can be described as current constraints to optimum production levels (such as pests), adoption of best management practices in the growing and milling sector, opportunities for improvement and diversification of the business base of the industry as well as environmental and social issues appropriate to the industry's operations and relationships with its neighbours.

Program 1 *Growing the Crop*

The challenges and opportunities relevant to the provision of a reliable and increasing supply of sugarcane remain a critical aspect of the continued success of the industry. Issues associated with production constraints, exotic pest threats, better utilisation of traditional inputs of water and fertiliser (in particular) and the opportunities associated with emerging technologies continue to provide challenges to the industry and to the RD&E sector. While many of these issues have been long-standing challenges to the industry, new technologies provide an opportunity for the RD&E sector to review their approaches to addressing them.

Critical Success Factors

Specific aspects of crop production and management which constitute major limitations or opportunities to the growing sector include:

- **Plant genetics** (*including introgression and molecular markers*): The current genetic variation amongst global commercial cane varieties is based on a limited number of inter-specific crosses made in the 1920s. In the last 10 years attempts have been made to expand this genetic base through introgression of a range of other sugarcane parental species with the aim of bringing in more genotypic control of biomass yield, ratoonability, sugar production and pest resistance. Australian scientists have been at the forefront of this difficult challenge through collaboration between CSIRO/BSES and the Chinese groups.
- **Pest control** (*specifically weed and nematode management, and exotic pest incursions*): Crop losses from nematodes and weeds alone have each been recently valued at \$80 –\$100M annually. Yield loss associated with unmanaged weed populations can exceed 20% with no weed management applied in the first 12 weeks of crop establishment. Exotic pest incursions such as sugarcane smut and the re-emergence of Fiji Disease and Orange Rust in 1990s and 2012 highlight both the genetic plasticity of the causal organism and the challenges faced in maintaining vigilance against these biotic agents from both a native and exotic source.
- **Soil – plant interactions** (*including soil health and plant establishment*): Yield decline investments by SRDC coupled with many other investments in this field have only partially satisfied an industry concern that yields of current varieties continue to decline with continued cropping. Furthermore, the impact of farm mechanisation (particularly the harvester) on the agronomy and growth of the crop continues to be felt as soil compaction, stool damage and soil borne diseases (in particular) continue to hinder optimum productivity levels. Planting configurations such as row spacing, stool population and skip row farming continue to be explored amongst the industry. Unfortunately these efforts have been exploratory and disjointed and require a significant effort and determination to better understand if the yield increases (as much as 50%) referred to in some earlier (SRDC funded) reports can be confirmed.

- **Harvesting** (to reduce cane losses during harvesting): Harvester design, use and their commercial operations in the last 10 years, coupled with challenges for available bin transport, has led to an increasing level of cane and sugar loss associated with harvester operations. Stool damage and loss also contribute to decreasing productivity of ratoons. Losses as high as 20t cane/ha and associated sugar losses have recently been documented. Currently no operational support is available to deal with the demands and expectations of the harvester operator, the grower and the miller for an operation now documented at almost 30% of the total cost of production.

CSIRO's Dr Karen Aitken and Jingchuan Li formed part of the Sugarcane Genome Team, who were awarded SRDC's overall Research Team Innovation Award, announced during the 2012 ASSCT Conference.

Deliverables and Measures of Success

- Number of technologies, plant varieties, practices, processes and/or systems at the RD&E stage to:
 - Limit production losses from weeds, diseases and pests, including incursion threats
 - Increase the genetic potential of sugarcane
 - Improve harvesting system relevant to the current economic drivers and requirements of the millers, growers and harvester operators.

Outcome

- A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane.



Program 2 Milling the Crop

Profitability of the milling sector is a function of the crop size, quality and reliability; efficiencies of the factory components; maintenance and transport costs. Furthermore, the limited use of the capital investment during the relatively short harvesting period (often 22 weeks) also constitutes a significant impediment to the best profitability of a mill.

Critical Success Factors

To survive the increasing costs of capital and manpower, mills are seeking to lower their unit costs and to make more effective use of the materials and available resources. Labour market competition is also placing a significant challenge on mills to maintain appropriately skilled workers to operate the mills during this limited season length. Areas targeted for investment include:

- **Mill capital use and operating efficiency:**
The capital associated with the milling of the crop as well as the operational costs represent the two largest costs to this sector of the industry. Research which helps to develop and deliver alternative, lower footprint options for machinery design or lower capital cost, lower maintenance costs and availability and capacity of plant are sought.
- **Enhancing the value of existing products:**
The main products of the current Australian sugar industry remain as raw sugar (principally exported for refining into food products), some molasses for stock feed and fermentation opportunities, and cogeneration from bagasse firing. Business opportunities to add value to these mainstream businesses are continually sought on the basis that they provide a reasonable investment opportunity and limit the interference to the main infrastructure of the mill. With the growing demand for carbohydrates as simple sugars or complex sugars from fibre as a substrate for green chemistry there is a growing interest in and investment in sugarcane by many of the internationally based agricultural and industrial manufacturing groups.

- **Transport efficiency:** Transport costs also remain a significant component of the overall costs for the miller. Outcomes focussed on reducing these costs (\$/tonne/kilometre/person) such as better utilisation of the transport infrastructure, scheduling and other operational efficiencies remain a priority.
- **Raw sugar quality:** In a competitive global marketplace with returns to the industry based largely on global prices and discounts, it remains imperative for Australia to maintain its reputation for excellent quality sugar.

Deliverables and Measures of Success

- Number of technologies, practices and/or systems at the research, development and extension stages to:
 - Improve processes and materials within sugar mills
 - Support the industry capacity to produce quality sugar to meet market needs
 - Development of market appropriate and optimum performance cane transport systems
 - Maintain an awareness of, and facilitate where possible, value adding opportunities to the current use of the sugarcane plant and its co-products.

Outcome

- A profitable milling sector utilising new and improved technologies and processes.

Program 3 *Sustaining the Environment*

The sugar industry is maintaining its commitment to acceptable and manageable environmental impacts which ensure the long term sustainability of both the industry and its neighbours. This is being done either through Government-initiated legislation or determination to maintain appropriate stewardship of the natural resources associated with the sugarcane industry and its neighbouring ecosystems.

Critical Success Factors

To help support this position the following issues and opportunities are identified for further investment:

- **Positioning industry as a leader in environmental responsibility:** This would be achieved through improved practices and monitoring. With the cane industry in close proximity to urban communities and sensitive ecosystems it is imperative that the industry contains its impact on site and uses the most environmentally responsible products, practices and processes. Government legislation and grants have recently provided many of our growers and millers with the additional incentive to make these changes. It is important to maintain this enthusiasm for innovation and monitor the impact of any changes made so as to better demonstrate our commitment to environmental sustainability. The industry needs to engage and partner to ensure that we are cognisant of issues as they arise, equipped with options to respond, and in a position to report on and promote performance.
- **Waste minimisation and utilisation:** In earlier days the industry was profitable from just the one product stream and was able to dispose of large waste streams cheaply and easily. As such the industry must look to extract additional value, through the production of by-products, from what has traditionally been considered 'waste streams'. In addition, the industry must look at new technologies to minimise waste generation and recycle where possible. The industry has already applied this logic to bagasse. Once burnt inefficiently by mill boilers to dispose of its large volume, with the introduction of new technology bagasse can now be burnt much more efficiently resulting in electricity being generated to supply the mill and the community grid, or a surplus made available for new products.
- **Preparing for a global environment with different resource availability and values:** As global population increases, not only does the global food demand increase but the availability of suitable agricultural land and inputs is expected to become more scarce. This will see the price of inputs such as chemicals and fertiliser increase. The industry can respond in two ways to this challenge, investigate alternative and more sustainable sources of its nutrients, pesticides and inputs, and investigate processes that reduce our use and dependence on these inputs. It is also likely that in an environment of strong global food demand, traditional values may change. There may be a shift in the way Australia views its balance of imports and exports in an effort to secure its own food supply, demand for higher calorie food or the highest producing commodities to be produced from high quality agricultural land. High productivity may become the norm.

Deliverables and Measures of Success

- Develop and implement an environmental stewardship program
- Investigate product diversification/waste utilisation opportunities
- Undertake a longitudinal study of industry economic, environmental and social footprint.

Outcome

- Coordinate, facilitate and extend, as appropriate, existing environmental stewardship programs.

Program 4 Skills and Capabilities

People are critical to the success of the sugar industry. Underpinning any future for the Australian sugar industry is a commitment to the skills base and innovativeness of the various groups comprising its operations.

SRDC remains committed to supporting industry groups and individuals to bring about positive change in practices and attitudes.

Critical Success Factors

To this end, SRDC will continue investment in people through the following themes:

- Innovation skills: In order to build the RD&E capability and innovation skills within the industry and its supporting research community, there is a need to develop capacity in RD&E gaps and to nurture the next generation of researchers. There is also a need to foster a culture of innovation by encouraging creativity and innovation across the industry.
- Leadership and decision making skills: The issue is to maximise opportunity for input into the industry decision-making areas at all levels regardless of age and gender. The sugar industry's internal and external environment is highly complex and rapidly evolving. Leaders need to improve their capacity to lead and embrace change. Leaders in the sugarcane industry need skills, networks and a whole of industry perspective to contribute effectively to debate in many of the issues challenging the industry. Research is needed to identify and address impediments to individuals taking leadership roles and to undertake strategies to increase the capacity to lead and innovate. There is also a need to ensure ease of succession and maximum input from groups who are not involved in mainstream leadership and management roles. Furthermore, for increased farm and industry efficiencies to be realised, technical and financial skills are needed to enhance the ability to make sound business and financial decisions.
- Business practices and value chain improvements: To achieve a sustainable industry, all sections of the sugarcane value chain need to be profitable. Development and improvements across the value chain in terms of business performance and new ways of cooperating across different players need to be explored.
- Extension and adoption of research: There are many factors that can assist or hinder the adoption and efficiencies of best practice. Significant economic gains are made when the rate of appropriate adoption is increased. To achieve this we need a thorough understanding of the factors that can impact change in practices and effective transfer of research outputs to end users, as well as the ways that this information can be effectively delivered and used.

Deliverables and Measures of Success

- Provide events, mentoring training, scholarships, information and industry group support (funds, guidelines and staff) to:
 - Increase farm and business managers and advisers' awareness, capacity and skills to identify improvements and adopt associated technologies and best practices
 - Fill identified RD&E skills gaps in the industry
 - Support people in leadership positions to enhance their capacity to drive the industry forward
 - Develop and support effective relations across the value chain to drive the industry forward.

Outcome

- An industry committed to a culture of education, learning and innovation.



Matt Kealley (pictured left), who received funding from SRDC to attend the 2011 Training Rural Australians In Leadership (TRAIL) Course, shares his thoughts on the program with 2012 TRAIL Blazers Scholar Dr Graham Bonnett.

Investment Strategy

Previous Investments

Previous RD&E investments across the industry focused on a wide range of fields/issues:

- Farming, harvesting and milling systems
- Value chain efficiencies
- Variety development
- Complementary products
- Analysis/benchmarking/business practices
- Adaptability and risk management
- Adapting best practice
- Resource input efficiencies
- Biosecurity and
- Enhancing environment/social performance.

Future Investments

Significant advances in today's science and technologies, coupled with the drive towards a modern agriculture interfaced with industrial manufacturing presents a number of strategic opportunities for many of the crops traditionally used for a single purpose. In particular, the increasing demand for global energy has carbon fixation crops such as maize, sorghum and sugarcane at the centre of attention of large global agricultural multinational companies.

Whether Australian sugarcane continues to be the focus of an export based raw sugar industry or expands its horizon to a business based on the carbon sequestration capacity of the sugarcane plant or product valuation, the challenge remains to strive for maximum and optimum yield from the inputs invested such as water and fertiliser.

In supporting a drive for a significant culture of innovation, SRDC will strive to support and drive RD&E in keeping with the foresight and commitment shown by the Australian industry personnel over the last century. To facilitate this position, SRDC wishes to focus resources on some key science/technology areas, which are considered to be of high importance/opportunity for the creation and delivery of sustainable and attractive industry benefits.

SRDC will maintain a commitment to innovation at all levels of its activities, whether in areas of research, development or adoption, technology transfer, participative action learning or research, adult learning, short, medium or longer term research, strategic, blue sky or tactical research.

SRDC further acknowledges that without an investment in all stages of a product development cycle, the ultimate delivery of benefits from an initial investment in research may not be delivered to the industry. SRDC also recognises the risks associated with any investment in research.

SRDC also acknowledges the very high risk of failure that is associated with an investment in RD&E. This is particularly the case where significant step changes in outcomes are sought through RD&E activity. SRDC will manage this risk by having a balanced portfolio of high, low and medium risk investments as well as through the use of

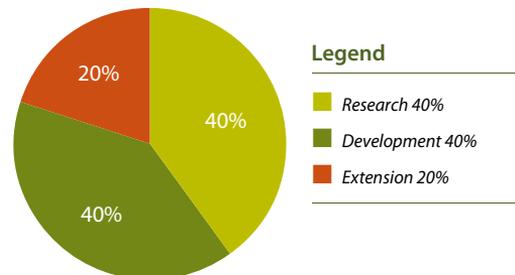
critical milestone payments for projects to ensure appropriate evaluation of projects when milestones are not achieved and at completion of the project.

While many models exist for the description of scientific horizons or technology transfer paradigms, the following categorisation of the key stages associated with RD&E is used for simplicity.

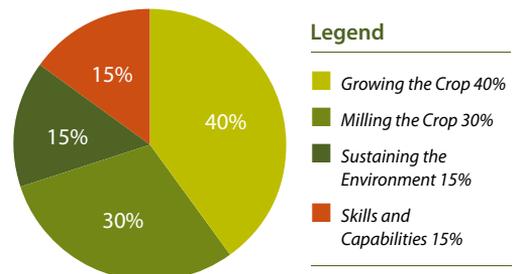
- **Research:** the initiation and development of hypotheses and the testing of these
- **Development:** the adaptation of research into a commercial product or service
- **Extension:** the ultimate uptake of the product or service to the customer or end user.

This categorisation does not infer any commitment or otherwise to older schemas describing traditional consultancies and extension, nor of the relevance or otherwise of more recent schemas for participative action learning and research systems.

An indicative portfolio of investment is defined as follows:



The same investment portfolio characterised according to the four programs is summarised as follows:



Summary of SRDC Outcomes, Deliverables and Inputs for 2012–2017

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

Corporate Functions

Risk Management

The management of research investments recognises the high risk of scientific 'failure' in the sense that any given hypothesis proposed under a research project may not deliver the results expected. To strive to understand these discrepancies forms the very basis of learning and scientific advancement and knowledge development. The challenge of management of these 'failing' research investments is to acknowledge the point at which the investments should be closed down and alternative hypotheses developed and proposed.

SRDC maintains a system for acknowledging and monitoring various risks associated with the operation of research projects. These systems and the policies associated with their implementation are included in the Risk Management portfolio overviewed by the SRDC Audit Committee.

Performance Assessments

Program Level

During the term of this RD&E Plan, SRDC will monitor and evaluate its performance in achieving the four principal Investment Program outcomes, namely:

- A profitable and market-driven industry underpinned by advanced technology producing a reliable and increasing supply of sugarcane
- A profitable milling sector utilising new and improved technologies and processes
- A sugar industry maintaining an awareness of and implementing best practices to ensure the impact of the industry's operation on the environment is kept to a minimum
- An industry committed to a culture of education, learning and innovation.

The achievement of, or significant progress towards achieving, the more specific Key Deliverables shown in previous Tables will be monitored and reported annually.

During the course of the Plan, reports, case studies, and surveys will be conducted to document and illustrate these achievements against baseline data. This will form the basis of documenting return on RD&E investment and guiding future investment targets. At the end of this Plan, these will be drawn on and aggregated to provide the evidence for the Measures that are associated with each Key Performance Indicator in each Program.

Project Level

Evaluations of achievement at the Investment Arena level will be supported by monitoring and evaluation at the individual project level, in terms of delivery against agreed outputs and outcomes. At this level, much of the base data for monitoring and evaluation against the KPIs will be generated. 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 delivering these outputs and outcomes and thereby achieving impact.

Corporate Level

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

1. Are SRDC's RD&E investments well targeted and responsive to priority needs?
2. Is SRDC delivering on industry priorities and the Australian Government's national and rural industry priorities?
3. Is SRDC continually improving the management of its RD&E portfolio by learning, experimenting, and influencing beneficial change?

The processes that SRDC uses in addressing these questions include an annual review of the SRDC and Board performance by an external representative (as part of an annual review of all Research and Development Corporation activities); 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.

Legislative Framework

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* (CAC Act).

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

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

The PIERD Act establishes the following functions for SRDC:

- To investigate and evaluate the requirements of the sugarcane industry for RD&E, and on the basis of that investigation and evaluation, to prepare an RD&E plan, and to review and revise the plan
- To prepare an Annual Operational Plan for each financial year

- To coordinate or fund the carrying out of RD&E activities that are consistent with the Annual Operational Plan prepared by the Corporation and in force at the time
- To monitor, evaluate and report to the Parliament, the Minister and its representative organisations on RD&E activities that are coordinated or funded, wholly or partly, by the Corporation
- To facilitate the dissemination, adoption and commercialisation of the results of research and development for the sugarcane industry
- Such other functions as are conferred on the Corporation by this Act or any other 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 sugarcane industry
- To achieve sustainable use and sustainable management of the natural resource base of the sugarcane industry
- To apply industry, scientific and community resources more effectively to R&D in the sugarcane industry
- To manage SRDC resources efficiently and to improve the accountability for expenditure on RD&E for the sugarcane industry.

Funding of SRDC

Funding of SRDC is by statutory levies collected from growers and millers from industry, with matching Australian Government contributions up to 0.5% of the gross value of production (GVP).

Levies are imposed under Schedule 24 of the *Primary Industries (Excise) Levies Act 1999* and collected under the *Primary Industries Levies and Charges Collection Act 1991* and subsequent amendments.

Since 2002, the levy has been \$0.14 per tonne of sugarcane crushed, divided equally between growers (7 cents per tonne) and millers (7 cents per tonne).

Industry Representative Organisations

The PIERD Act prescribes the following representative organisations of SRDC:

- Australian Cane Growers' Council Limited
- Australian Cane Farmers' Association Limited
- Australian Sugar Milling Council Proprietary Limited.

SRDC is accountable to both the Australian Government and these representative organisations. SRDC meets formally with the representative organisations three times each year to discuss SRDC activities, statutory reporting, levy arrangements as requested, RD&E priorities and any other matters of mutual interest.

Responsible Minister

SRDC is accountable to the Federal Parliament through the Minister for Agriculture, Fisheries and Forestry. The Minister or the Parliamentary Secretary:

- Approves the Five Year RD&E Plan and the Annual Operational Plan
- Appoints Directors of SRDC on the recommendation of the Sugar Research and Development Corporation Selection Committee
- Appoints the Chairperson of SRDC.

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.

Leadership

SRDC operates under the direction of a Board, which is responsible for developing the Corporation's policies, governing its operation and monitoring its performance. 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 Scholarship Committee, which provides advice to the Board on policies relating to scholarships and the awarding of scholarships.

The Key Board Functions:

- Establishing goals and setting strategic direction
- Developing and approving a Five Year RD&E Plan, an Annual Operational Plan and producing an Annual Report
- Establishing policies and approving procedures for the operation of SRDC
- Ensuring that risk assessment and management frameworks are in place to minimise business and financial risk
- Ensuring that RD&E 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 RD&E Plan defines SRDC's core business, indicates broad priorities for RD&E and defines the corporate strategy to achieve its outputs and outcome.

The Annual Operational Plan (AOP) specifies the broad groupings of RD&E activities that SRDC proposes to fund during the financial year together with an estimate of income and expenditure. The AOP is 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 outcomes, outputs, performance information and financial position each year. It is consistent with the Five Year RD&E Plan and the AOP and is tabled in Parliament.

The SRDC Annual Report gives particulars of RD&E activities funded during the year (inputs), and a review of how SRDC has performed in relation to the objects of the PIERD Act, the RD&E Plan and its corporate outputs and outcome. The Annual Report must be submitted to the 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 Board meeting outlining key decisions taken.

The Chair and Executive Director meet twice each year 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 folds active quality assurance into daily management. 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 Equivalents to International Financial Reporting Standards.

Risk Management

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

Monitoring

This SRDC RD&E Plan 2012–2017 outlines strategies and performance measures that provide a framework for monitoring activities and measuring corporate performance. Details of the monitoring process associated with the KPIs will be addressed and reported in the Annual Operating Plans, the Portfolio Budget Statements and the Annual Reports submitted to DAFF.

Abbreviations and Acronyms

Codes Organisation

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACFA	Australian Cane Farmers' Association
ACGC	Australian Cane Growers' Council (<i>known as Canegrowers</i>)
AOP	Annual Operational Plan
ASA	Australian Sugar Industry Alliance
ASMC	Australian Sugar Milling Council Proprietary Limited
ASSCT	Australian Society of Sugar Cane Technologists
BMP	Best Management Practice
BPMS	Business Process Management System
BSES	BSES Limited
CAC Act	<i>Commonwealth Authorities and Companies Act 1997</i>
CBP	Capacity Building Project
DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
DEEDI	Department of Employment, Economic Development and Innovation (QLD)
GGIP	Grower Group Innovation Project
NIR	Near Infrared
PIERD	<i>Primary Industries and Energy Research and Development Act 1989</i>
PIMC	Primary Industries Ministerial Council
R&D	Research and Development
RD&E	Research, Development and Extension
RDC	Research and Development Corporations
SRDC	Sugar Research and Development Corporation



Dr Andrew Robson from the Department of Employment, Economic Development and Innovation (DEEDI) is currently working on the SRDC funded project titled 'remote sensing-based precision agriculture tools for the sugar industry.' This project is due for completion in August 2012.



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