

# Sugar Research and Development Corporation



**Annual Operational Plan  
1999/00**

# TABLE OF CONTENTS

Page No.

Preface

Executive Summary

Introduction

Long Term Research and Development Objectives

Research and Development Program of the Sugar Industry and the Australian Government

Performance Indicators

Research and Development Environment

Annual Operational Plan for 1999/00

Overview

CP2002: Accelerated Establishment of the Sugar Industry and Profitability for the Australian Government

Program 1: Plant Improvement

Program 2: Crop Management

Program 3: Crop Protection

Program 4: Cane Harvesting and Transport

Program 5: **Annual Operational Plan**

Program 6: Environmental Management

Program 7: Enhanced Marketing

Program 8: Industry Competitiveness

Attachment A

Allocation of SRDC Funds for 1999/00

Attachment B Sugar Research and Development Corporation November 1999

PIERD 1999/00 Research and Development Objectives

Attachment C The work is copyright material from the Act as amended under the Copyright Act 1968, no part may be reproduced by any process without written permission from the Sugar Research and Development Corporation.

Requests and enquiries concerning reproduction and rights should be addressed to the Executive Director at the address on the following page.

Cover photo: Front Research in the Yield Decline Joint Venture, which will enter Phase 2 in 1999/00 has identified substantial yield increases associated with the use of break crops.

Area: Sugarcane in the Old River Irrigation Area. The area has considerable potential for sugarcane production but the discovery of sugarcane smut in July 1998 has led to R&D activity to identify resistant varieties.



Sugar Research and Development Corporation, November 1999

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without written permission from the Sugar Research and Development Corporation.

Requests and inquiries concerning reproduction and rights should be addressed to the Executive Director at the address on the following page.

Cover photos:

*Front:* Research in the Yield Decline Joint Venture, which will enter Phase 2 in 1999/00, has identified substantial yield increases associated with the use of break crops.

*Rear:* Sugarcane in the Ord River Irrigation Area. The area has considerable potential for sugarcane production but the discovery of sugarcane smut in July 1998 has led to R&D activity to identify resistant varieties.

# TABLE OF CONTENTS

	Page No.
Preface	v
Executive Summary	1
Introduction	4
Long Term Research and Development Objectives	5
Research and Development Priorities of the Sugar Industry and the Australian Government	6
Performance Indicators	8
Research and Development Environment	9
Annual Operational Plan for 1999/00	10
Overview	10
CP2002: Accelerated Enhancement of Productivity and Profitability for the Australian Sugar Industry	13
Program 1: Plant Improvement	15
Program 2: Crop Management	17
Program 3: Crop Protection	20
Program 4: Cane Harvesting and Transport	23
Program 5: Sugar Manufacture	25
Program 6: Environmental and Natural Resource Management	27
Program 7: Enhanced Marketability	30
Program 8: Industry Competitiveness	31
<i>Attachment A</i>	33
Allocation of SRDC funds for 1999/00	
<i>Attachment B</i>	34
PIERD 1999/00 Research and Development Portfolio	
<i>Attachment C</i>	50
CP2002 1999/00 Research and Development Portfolio	

ISSN 1036-6863

## BACKGROUND

Section 25 of the *Primary Industries and Energy Research and Development (PIERD) Act 1989* requires that the Sugar Research and Development Corporation develop and prepare a written Annual Operational Plan.

This Plan is required to set out the broad groupings of eligible activities that the Corporation proposes to fund in that year.

The Plan must also describe the extent to which these activities address the Corporation's Research and Development Plan 1995–2000.

This document is the Annual Operational Plan (AOP) for 1999/00.

### SRDC Board Members 1999/00:

Chairperson	Mr C P Hildebrand
Deputy Chairperson	Mr N K Greenwood (to 30 September 1999)
Government Director	Mr R S Jeffery (to 2 September 1999) Mr I R Cottingham (from 2 September 1999)
Directors	Mr J C Baird Dr P S Brennan Mr I L Fraser Professor R E Jones Dr G J Persley (to 30 September 1999) Mr A Barfield (from 1 October 1999) Mr D R McGuffog (from 1 October 1999)
Executive Director	Mr E S Wallis

### Contact Addresses:

SRDC  
PO Box 12050  
Brisbane Elizabeth Street  
QLD 4002

Phone: (07) 3210 0495  
Fax: (07) 3210 0506  
Email: [srdc@srdc.gov.au](mailto:srdc@srdc.gov.au)

### Office Locations:

Brisbane: Level 16, 141 Queen Street, Brisbane.  
Innisfail: 88 Rankin Street, Innisfail.



## PREFACE

This Annual Research and Development Program (Annual Operational Plan) is the last to be prepared based on the SRDC R&D Plan 1995–2000.

SRDC has been working with the sugar industry organisations, research providers and government in developing a replacement R&D Plan. It is expected that the new R&D Plan 1999–2004 will be submitted to the Minister for Agriculture, Fisheries and Forestry for approval by the end of September 1999.

SRDC expects to retain the existing eight program structure but the format will be enhanced through the adoption of an output/outcome framework at the Program level.

In addition the output/outcome framework will be applied at a more strategic level to enhance SRDC's accountability. A copy of the proposed outline of the R&D Plan and the definitions used to derive the output/outcome framework are attached to this preface.

The Commonwealth Authorities and Companies Act 1997 provides new reporting requirements for SRDC. The replacement R&D Plan 1999–2004 will guide SRDC's achievement of these new requirements. The SRDC Annual Report for 1999/00 will meet these new requirements so that this Annual Operational Plan will be translated into the new Plan format once it is approved.

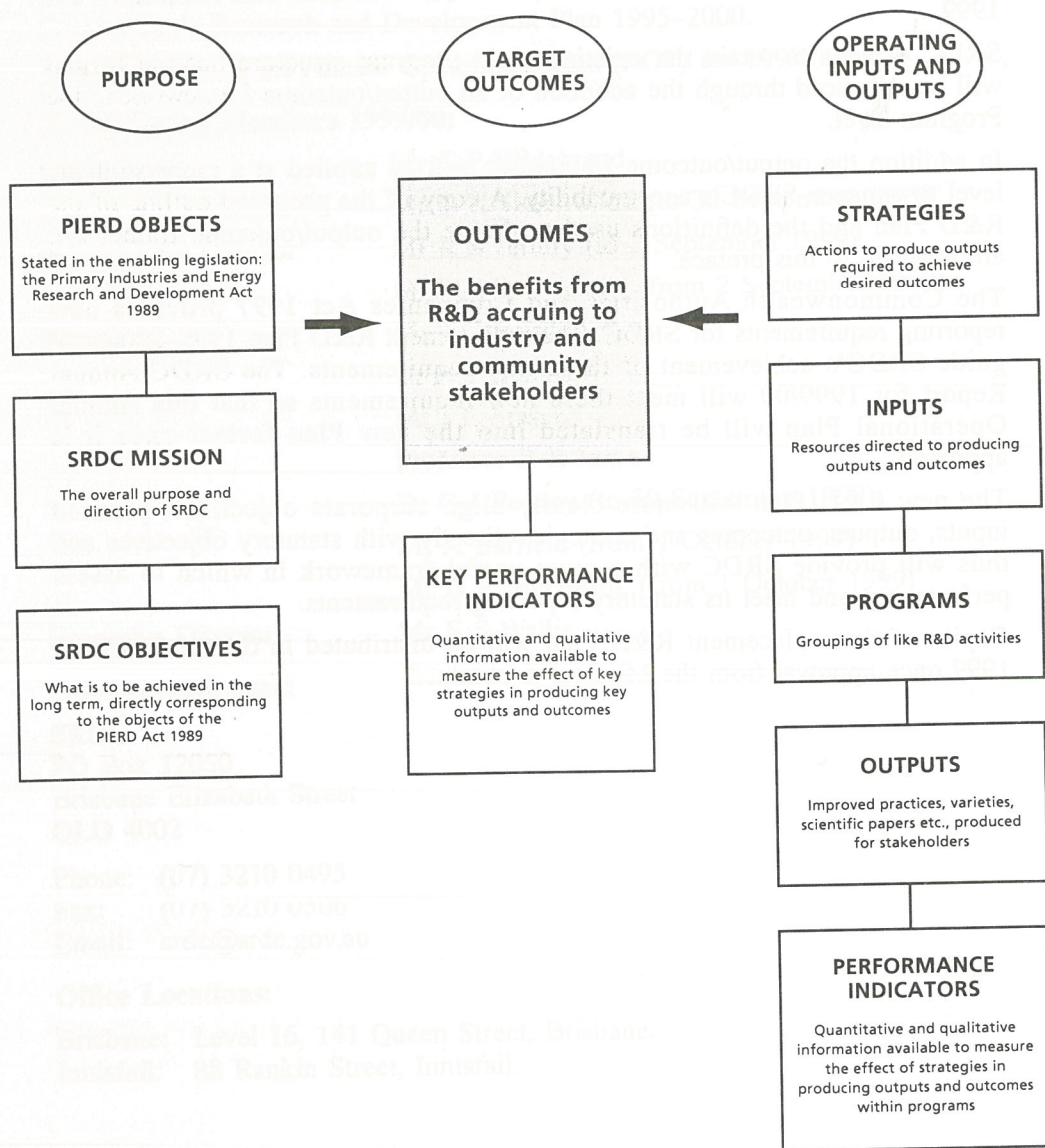
The new R&D Plan will more clearly align corporate objectives, planned inputs, outputs, outcomes and strategies directly with statutory objectives and thus will provide SRDC with a more useful framework in which to assess performance and meet its statutory reporting requirements.

Copies of the replacement R&D Plan will be distributed in the latter part of 1999 once approval from the Minister is obtained.

# SUGAR RESEARCH AND DEVELOPMENT CORPORATION

## RESEARCH AND DEVELOPMENT PLAN 1999–2004

### OUTLINE AND DEFINITIONS

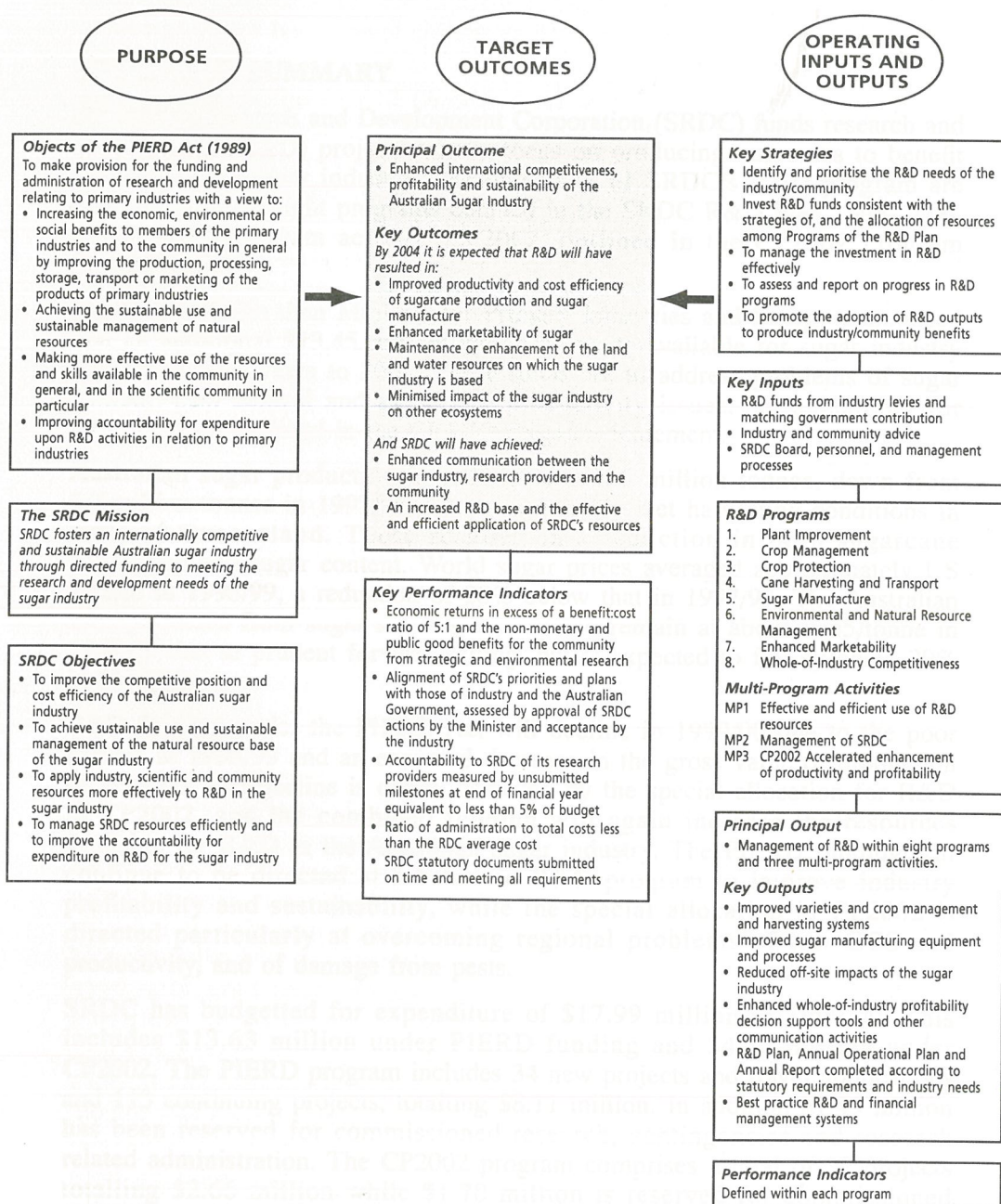




# SUGAR RESEARCH AND DEVELOPMENT CORPORATION

## RESEARCH AND DEVELOPMENT PLAN 1999–2004

### OVERVIEW





**SUGAR RESEARCH  
AND  
DEVELOPMENT CORPORATION**

**ANNUAL OPERATIONAL PLAN  
1999/00**

**EXECUTIVE SUMMARY**

The Sugar Research and Development Corporation (SRDC) funds research and development (R&D) projects with a focus on producing outcomes to benefit the Australian sugar industry. The objectives of SRDC's R&D program are addressed within eight programs detailed in the SRDC R&D Plan 1995–2000, and a cross program activity, CP2002, outlined in the CP2002 Program Statement.

In July 1998, the then Minister for Primary Industries and Energy announced that an additional \$13.45 million would be made available for sugar industry R&D over four years to 2002. These funds are to address problems of sugar content, pest control and associated productivity issues. Accountability for these funds is outlined in the CP2002 Program Statement.

Australian sugar production in 1998/99 was 4.9 million tonnes, down from 5.7 million tonnes in 1997/98 due to excessively wet harvesting conditions in most of Queensland. These resulted in a reduction in both sugarcane production and sugar content. World sugar prices averaged approximately US 7.9c/lb in 1998/99, a reduction of 28% below that in 1997/98. The Australian average return from sugar sales is expected to remain at about \$345/tonne in 1998/99 due to prudent forward selling, but is expected to fall by some 20% in 1999/00.

R&D funding under the PIERD Act will decline in 1999/00 due to the poor harvest in 1998/99 and an expected decrease in the gross value of production in 1999/00. The decline is offset, however, by the special allocation for R&D in CP2002, and the combined funding will again increase the resources available for R&D in the Australian sugar industry. The PIERD funding will continue to be directed at a balanced R&D program to improve industry profitability and sustainability, while the special allocation in CP2002 is directed particularly at overcoming regional problems of low CCS and productivity, and of damage from pests.

SRDC has budgetted for expenditure of \$17.99 million in 1999/00. This includes \$13.63 million under PIERD funding and \$4.36 million under CP2002. The PIERD program includes 34 new projects and travel applications and 113 continuing projects, totalling \$8.11 million. In addition \$1.49 million has been reserved for commissioned research, contingencies and research related administration. The CP2002 program comprises a total of 32 projects totalling \$2.66 million while \$1.70 million is reserved for commissioned research, contingencies and research related administration.

Within the PIERD budget, SRDC is also recommending that funds be allocated to support R&D infrastructure. In Queensland, \$2.50 million has been earmarked for the Bureau of Sugar Experiment Stations (BSES) and \$0.12 million for the Sugar Research Institute (SRI) as partial support for the delivery of R&D. In New South Wales, \$0.16 million has been earmarked as partial support for the Farm Extension Service operated by the NSW Sugar Milling Co-operative Ltd to three mill areas. A further \$0.15 million will be provided for R&D capability development in the Cooperative Research Centre for Sustainable Sugar Production (\$0.11 million) and for Machinery Innovators Awards (\$0.04 million). Funding of \$0.29 million is proposed for postgraduate scholarships.

Attachment A provides details of the proposed \$13.63 million expenditure under each of the eight programs detailed in the R&D Plan 1995–2000 for the 1999/00 PIERD budget. It also provides details of the proposed \$4.36 million expenditure in CP2002 consistent with the CP2002 Program Statement.

In its 1999/00 program, SRDC has addressed the specific priorities of both the Australian sugar industry and the broader community as indicated by the Australian government. The commitment by the sugar industry and SRDC to protecting and enhancing the natural resource base of the industry and adjacent ecosystems is reflected in Program 6 of the SRDC R&D Plan, Environmental and Natural Resource Management. Most of the R&D in this Program, which represents 10% of the total R&D portfolio, is aimed at broader public benefits. Public benefits also accrue directly or indirectly from another 37% of projects in the remainder of the portfolio.

Projects included in the 1999/00 AOP cover a wide range of issues including cane genetic improvement through breeding and biotechnology; nutrition and irrigation management; soil structural and chemical degradation; plant establishment and fertiliser application; trash blanketing and sustainable production practices; insect pest and disease management and incursion prevention; cane harvesting and transport efficiency; identification and minimisation of off-site impacts; sugar manufacturing efficiency and use of by products; raw sugar quality; and industry competitiveness. Human resource development, extension and technology transfer activities are integrated into the eight relevant R&D programs.

SRDC utilises a system of working parties to assist in establishing priorities and assessing R&D projects in each of its eight programs. The working party members also assist in the review of sub-program areas and projects. This activity will be continued in 1999/00 as an important aspect of the accountability process. In addition, an Advisory Committee of industry representatives has been appointed to provide input on the allocation of CP2002 funds. A number of Consultative Committees have also been established to work with SRDC and the Advisory Committee in identifying priority R&D needs on an issue or regional basis.

The Australian sugar industry faces a difficult period in the next two to three years. While recovering from poor yields caused by a wet harvest in 1998/99, and from flooding in north Queensland early in 1999, world prices are not expected to recover to 1997/98 levels until 2002/03. The research base underpinning the industry, however, remains strong with 35 research providers



in 1999/00 compared with 20 five years ago. The increased resources available for R&D, including those directed to specific problems in CP2002, maintain the focus on issues that will improve profitability in the short term and contribute to the longer term sustainability of the industry.

# **SUGAR RESEARCH AND DEVELOPMENT CORPORATION**

## **ANNUAL OPERATIONAL PLAN 1999/00**

### **INTRODUCTION**

The Sugar Research and Development Corporation (SRDC) funds research and development (R&D) projects aimed at producing outcomes that benefit the sugar industry and the Australian community through plant improvement, improved crop management and crop protection systems, improved harvesting and transport, enhanced efficiency of sugar manufacture, enhanced marketability, improved environmental and natural resource management and improved industry competitiveness.

In July 1998, the then Minister for Primary Industries and Energy, the Hon. John Anderson, announced that an additional \$13.45 million would be made available for sugar industry R&D over four years commencing in 1998/99. These funds supplement the Australian Government current contribution to sugar R&D under the PIERD Act and will be managed by SRDC consistent with its obligations to the Australian sugar industry and the Government. SRDC concluded that the most appropriate process to manage and account for these additional funds was to establish an additional cross program activity CP2002 "Accelerated Enhancement of Productivity and Profitability for the Australian Sugar Industry". The Program Statement for CP2002, which complements the SRDC R&D Plan 1995–2000, was approved by the Minister for Agriculture, Fisheries and Forestry in November 1998.

In July 1998, SRDC advertised nationally for preliminary project proposals to be received by the end of September 1998. At this time, the Minister announced that the additional funds would be available to address problems of low sugar content and pest control, and related factors contributing to the current productivity situation. An additional advertisement was therefore placed with information on the type of projects required.

Two hundred and fifty one preliminary applications were received and considered by SRDC according the following criteria:

- The priority of the issue as identified in the SRDC R&D Plan 1995–2000 and the CP2002 Program Statement;
- The priority of the project as it addressed the issue, and
- Appropriateness of the focus, objectives, methods and proposed outcomes of the project.

Proponents were advised in November 1998 of the priority of applications. The Corporation invited 58 of the applicants to submit full proposals for consideration for inclusion in the 1999/00 R&D program. In addition, 18 were invited to submit full proposals to commence in 1998/99 in CP2002 and were included in the SRDC Supplementary R&D Program 1998/99 approved by the



Minister for Agriculture, Fisheries and Forestry in December 1998. The total number of full proposals invited was therefore 76 or 30% of the preliminary proposals received, compared with 37% in 1998/99 and 39% in 1997/98.

Seventy-six full proposals (including travel applications) seeking funding to commence in 1999/00 were considered at the budget meeting in March 1999. Following discussions with the relevant research institutions, the final portfolio of projects was consolidated by SRDC for submission to the Minister for Agriculture, Fisheries and Forestry in April 1999.

## **LONG TERM RESEARCH AND DEVELOPMENT OBJECTIVES**

The broad objectives of SRDC as stated in the SRDC R&D Plan 1995–2000 are:

- to improve the long-term profitability of the sugar industry;
- to achieve sustainable use and management of natural resources by the sugar industry;
- to make more effective use of the scientific resources of Australia for the sugar industry; and
- to improve the accountability for expenditure on R&D for the sugar industry.

These objectives are aligned with the objects of the PIERD Act 1989 which are to make provision for the funding and administration of research and development relating to primary industries with a view to:

- (a) 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; and
- (b) achieving the sustainable use and sustainable management of natural resources; and
- (c) making more effective use of the resources and skills of the community in general and the scientific community in particular; and
- (d) improving accountability for expenditure upon research and development activities in relation to primary industries.

The eight programs detailed in the SRDC R&D Plan 1995–2000, together with the CP2002 Program Statement, provide a framework within which to address the Corporation's broad objectives. The programs are:

- CP2002: Accelerated Enhancement of Productivity and Profitability for the Australian Sugar Industry
- Program 1: Plant Improvement
- Program 2: Crop Management
- Program 3: Crop Protection
- Program 4: Cane Harvesting and Transport
- Program 5: Sugar Manufacture
- Program 6: Environmental and Natural Resource Management
- Program 7: Enhanced Marketability
- Program 8: Industry Competitiveness

## **RESEARCH AND DEVELOPMENT PRIORITIES OF THE SUGAR INDUSTRY AND THE AUSTRALIAN GOVERNMENT**

SRDC is not structured to undertake a direct role in research activities. It is a body within which a strategic view of the needs and opportunities for research and development in the industry can be crystallised, and through which appropriate research can be encouraged and funded.

In considering the needs and opportunities for R&D, SRDC takes into account:

- Industry priority issues;
- Australian Government priorities (representing views of the broader community);
- Views of R&D and agribusiness organisations.

The sugar industry priorities are integrated into the eight program areas of the SRDC R&D Plan 1995–2000 as the long term objectives, strategies and goals to be achieved.

In addition to the Australian Government's priorities for the Australian sugar industry incorporated into CP2002, the following priorities were identified by the Government in January 1997:

- *Identify strategic market access and investment opportunities based on improved access to international markets and then develop strategies to take advantage of these opportunities*

The objectives of Program 7, Enhanced Marketability, and Program 8, Industry Competitiveness, in the SRDC R&D Plan include enhancing the marketability of sugar by further developing the industry's high reputation for responsiveness to consumer requirements and enhancing market access and penetration of the sweetener market.

Continuing and new projects in these programs address the issues of sugar quality and industry profitability. This is critical to an industry exporting over 85% of production. In addition, SRDC has reserved funds in 1990/00 to commission follow-up activity to the study of factors influencing supply and demand in the world sweetener market conducted during 1998/99.

- *Increased productivity of land, labour and capital in rural industries*

A major objective of SRDC's R&D plan is to improve the long term profitability of the sugar industry while maintaining its resource base. A balanced R&D portfolio is funding projects to improve cane production via plant genetic improvement, improved irrigation, crop nutrition and land management techniques, and improved disease, insect, rodent and weed control through the development of integrated pest management systems. R&D resources are also directed at improved harvesting and transport systems, especially to expand the capacity for green cane harvesting, and at reducing the unit cost of milling operations through better use of existing capital and reduced maintenance costs.

- *Encourage the investment in and up-take of high quality Australian products*

Australia has a reputation for being a reliable supplier of high quality raw sugar on the world market, with more than 85% of total production exported. SRDC is funding R&D projects to improve the quality of sugar produced to



maintain access to existing markets and gain access to new ones. Current projects are concentrated on improving colour and reducing the level of impurities in raw sugar.

- *A competitive Australian export and import replacement sector based on increasing the value from production through increased processing and the delivery of value-added product to market*

Manufacture of raw sugar from sugarcane is an integral part of the sugar industry and SRDC directs 11% of its R&D portfolio to improvements in this sector. A strategy of increasing importance, and of direct relevance to this objective of the Australian Government, is to increase the revenue base from sugarcane processing. Strategies include increasing the efficiency and rate of the milling process, and finding alternative uses for by-products. Current projects are addressing issues related to spontaneous combustion in bagasse stockpiled for power co-generation and the use of bagasse to manufacture activated carbon.

- *Protect and enhance Australia's natural resource base*

Within the cane growing and manufacturing sectors, R&D to improve profitability in Programs 1 to 5 is conducted within the constraint of maintaining the industry's natural resource base. R&D on the environmental issues conducted within Program 6, Environmental and Natural Resource Management, is aimed primarily at off-farm and off-mill effects of sugar production. This Program is allocated 14% of SRDC's R&D funds and is addressing issues of integrated catchment management, the fate of applied fertilisers and pesticides and management practices to reduce their movement, avoidance of problems with rising watertables in irrigated areas, amelioration of soil acidity, improved quality of drainage waters, microbiology of cooling towers and spray ponds and improved safety in farm and mill operations.

These five Government priorities are addressed within the eight R&D Programs in the R&D Plan 1995–2000 and the CP2002 Program statement on which this SRDC 1999/00 AOP is based. In addition, activities relating to Ecologically Sustainable Development (ESD) are managed in two ways: the impact of sugar industry production and processing activity on other ecosystems through R&D in Program 6; and the development of industry practices which maintain and/or enhance the economic viability of sugar production and processing and the industry's natural resource base through R&D in the remaining seven Programs.

Benefits to the broader community, including spillover benefits beyond the sugar industry, will be a major outcome from more than 47% of the projects included in the AOP. The percentage of projects in this category is substantially less than in 1998/99 because most projects funded in CP2002 focus on delivering benefits to the sugar industry.

Projects delivering benefits to the broader community include 19 projects in Program 6 referred to in the final Australian Government objective above, which aim to minimise the impact of the sugar industry on other ecosystems. A further 52 projects (29% of the portfolio) are aimed at preventing or ameliorating degradation of the natural resource base within sugar production and manufacturing sectors, or providing benefits to the wider community

through contributions to training and communication. These include projects to develop varieties resistant to pests and diseases, to develop integrated pest management systems and reduce pesticide use, to increase the adoption of green cane harvest and trash blanketing, to conserve the water resource through the adoption of more efficient irrigation management systems, to develop reduced tillage systems, to ameliorate soil acidity and sodicity and to improve catchment drainage.

Fourteen projects (8% of the portfolio) in the areas of plant improvement, crop management, crop protection, cane harvest and transport and sugar manufacture will provide spillover benefits beyond the Australian sugar industry. These are strategic research projects in areas of biotechnology, sugarcane physiology, insect identification and various aspects of modelling milling operations.

SRDC consulted with its R&D providers during the development of its R&D Plan and the CP2002 Program Statement, and continued this consultation during the development of this Annual Operational Plan.

## **PERFORMANCE INDICATORS**

SRDC recognises that indicators of both industry and community benefit will be important in evaluation of its performance, although it is often impossible and undesirable to separate the industry and community issues when planning, implementing and delivering benefits from rural R&D. In its R&D Plan 1995–2000, SRDC has adopted four performance indicators as follows:

- *Economic returns including the non-monetary benefits for the community from strategic and environmental research*

To this end SRDC uses two kinds of benefit indicator. Firstly, it commissions independent cost/benefit analyses of completed projects. Secondly, it sets program goals which serve as preliminary, partial or qualitative measures of likely benefits or cost reductions. These indicators facilitate both quantitative and qualitative assessment of progress towards long term R&D objectives relating to profitability and sustainable use of resources.

- *Procedures for resource allocation*

SRDC has adopted an analytical process, developed within a benefit-cost framework, to set indicative proportions for the allocation of resources across broad program areas. This process is described in the R&D Plan.

This indicator provides an assessment of progress towards the third and fourth objectives relating to effective use of scientific resources and accountability. The process of selection of projects to be supported within programs is also outlined in the R&D Plan and is decided by two considerations: the effectiveness of the project proposals in addressing issues that are important for achieving SRDC's objectives and goals; and the quality of the proposals.

- *Accountability of research providers*

Project milestones, financial reporting requirements and progress reports are routinely monitored. In addition sub-program areas and selected projects are reviewed against stated objectives and continued relevance.



This provides an assessment of progress towards improving accountability for R&D expenditure.

- *Ratio of administrative to total costs*

As indicated in its R&D Plan 1995–2000, SRDC aims to maintain a low-cost administrative structure to provide effective, efficient and accountable management of SRDC resources. The operation of SRDC as stated in the Plan, is expected to cost no more than 6% of the total budget. The actual proportion for 1999/00 is 4.7% of total expenditure (Attachment A).

This provides a quantitative assessment of the relative cost of administration of SRDC while effectiveness and accountability measures are contained in the first three performance indicators.

A fifth performance indicator was added by SRDC in 1998 as follows:

- *Increase in the number of R&D providers*

This relates directly to the third objective of SRDC, to make more effective use of the scientific resources of Australia for the sugar industry. While this provides a quantitative assessment of the number of R&D organisations involved in SRDC funded projects, the effectiveness of the involvement is assessed in the first performance indicator.

## **RESEARCH AND DEVELOPMENT ENVIRONMENT**

The international R&D infrastructure for sugar is not as well developed as it is for the major food grain crops such as wheat and rice. Considerable interaction occurs in the R&D sector of the world sugar industry, including germplasm exchange, biotechnology and information exchange in pre-competitive aspects of growing and milling technologies. In many commercially sensitive areas, however, international competition has limited free exchange of information.

R&D funds for the Australian sugar industry have increased substantially over the past five years, including an increase in SRDC funding under the PIERD Act 1989, from \$9.3 million in 1994/95 to \$14.16 million in 1998/99. Funding under the PIERD Act will decline marginally in 1999/00 to \$13.63 million due to the poor harvest of 4.9 million tonnes of sugar in 1998/99, and an expected decrease in the gross value of production in 1999/00 due to lower prices to Australian producers.

The decline in funding under the PIERD Act is more than offset, however, by the special allocation for R&D in CP2002. In 1999/00 this is expected to be \$4.36 million within a total SRDC budget of \$17.99 million.

SRDC seeks to establish partnerships in research and development with the industry and the research community, focussed on addressing the strategic needs and opportunities of the industry. While the partnership model is expected to be favoured in most funding situations, SRDC acknowledges that commissioned research might occasionally be necessary to fill particular gaps in the program. This has occurred to a greater extent in the early stages of the CP2002 program.

World sugar prices are expected to average approximately US 7.9c/lb in 1998/99 (ABARE, Outlook 98 Proceedings, 1998), a significant reduction of

28% below that in 1997/98. The Australian average return from sugar sales in 1998/99 is expected to average \$345/tonne, similar to that in 1997/98 due to prudent forward selling. The Australian average price in 1999/00, however, is expected to fall by some 20% below returns in 1998/99.

While a decline in the gross value of production will result in decreased funds available under the PIERD Act, the special funding in the CP2002 program will again increase the funds available for R&D in the Australian industry. The PIERD funding will continue to be directed at a balanced R&D program to improve industry sustainability, while the special allocation is directed particularly at overcoming regional problems of low CCS and productivity and of damage from a number of pests.

The Australian sugar industry faces a difficult period in the next two to three years. While recovering from poor yields caused by a wet harvest in 1998/99, and from flooding in north Queensland early in 1999, world prices are not expected to recover to 1997/98 levels until 2002/03. The research base underpinning the industry, however, remains strong with 35 research providers in 1999/00 compared with 20 five years ago. The increased resources available for R&D, including those directed to specific problems in CP2002, maintain the focus on issues that will improve profitability in the short term and contribute to the longer term sustainability of the industry.

## **ANNUAL OPERATIONAL PLAN FOR 1999/00**

### **Overview**

SRDC maintained an active program of consultation with the industry and the research community during 1998/99. This involved discussions with the representative bodies of the industry (Australian Cane Farmers Association, Australian Sugar Milling Council and the Australian Cane Growers Council), and with the two main industry R&D organisations (BSES and SRI). There were also consultations with other major Australian research institutions, including CSIRO, Universities, various state and federal bodies as well as industry organisations such as NSW Sugar Milling Co-operative Ltd., CSR, Bundaberg Sugar, Sugar North and Mackay Sugar.

SRDC will continue to monitor the progress of projects which it funds. The adoption of a whole-of-life project agreement for all projects from 1998/99 requires regular milestone and financial reporting. Milestones average two to three per year for each project and result in improved accountability. Formal project reviews will continue for a small number of projects, in some cases required at a particular milestone. Most project reviews have been replaced by sub-program area reviews to ensure that R&D resources continue to be directed to priority issues.

An objective of SRDC is to achieve enhanced research activity for the industry by the major Australian research institutions. SRDC recognises that the dedicated industry research bodies (BSES and SRI) have a particular capability both to identify needs and opportunities and to relate the results of research to industry applications. Therefore, the Corporation strongly encourages the involvement of other research institutions in research projects which are linked

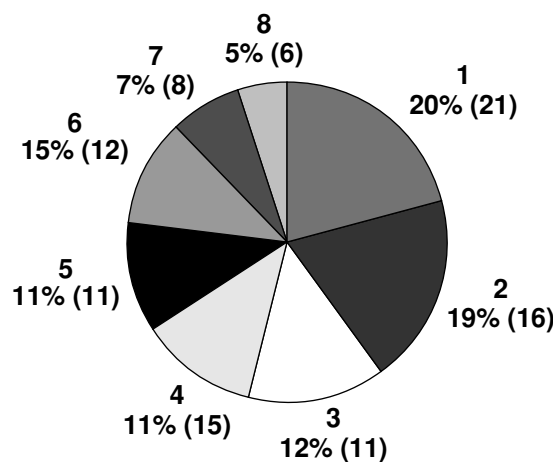
to these industry bodies. This will help to ensure a focus on industry needs, access to background knowledge of the industry and extension of results, while achieving a broader involvement of Australian research expertise directed to the resolution of industry problems.

Attachment A provides details of the proposed \$13.63 million expenditure under each of the eight programs detailed in the R&D Plan 1995–2000 for the 1999/00 PIERD budget. It also provides details of the proposed \$4.36 million expenditure in CP2002 consistent with the CP2002 Program Statement.

SRDC considered 76 new research and travel proposals at its budget meeting in March 1999. SRDC agreed to support 34 new projects in the normal PIERD budget and \$2.09 million has been recommended for this purpose. A further 11 new projects were supported for funding under CP2002 at a cost of \$1.22 million. Total project funding recommended within the PIERD budget is \$8.11 million while within CP2002 a total of \$4.02 million (including commissioned research) is recommended for 1999/00.

Support to be provided in 1999/00 to all projects within the PIERD budget is detailed in Attachment B while details of projects to be supported within CP2002 in 1999/00 are included in Attachment C.

**FIGURE 1 Actual and indicative (in brackets) proportions of funding allocated to each program in the PIERD budget in 1999/00**



The R&D Plan 1995–2000 provides indicative proportions for each Program based on a Resource Allocation Process adopted by SRDC to provide the maximum return to R&D investment. The indicative proportion and the budgeted proportion for each program for the 1999/00 PIERD budget are shown in Figure 1. As in previous years, the indicative proportions in the PIERD budget reflect quite closely the budgeted expenditure for most Programs. The exception is Program 4, Cane Harvesting and Transport, where the indicative proportion is substantially higher than the budgeted figure, despite concerted efforts to develop more projects worthy of funding in this critical area of sugar production. The budgeted expenditure in CP2002, however, deviated substantially from the indicative proportions. Programs 2



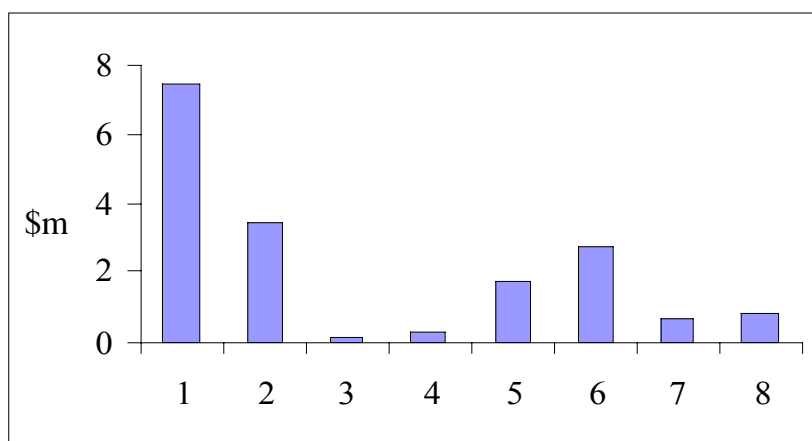
and 3 have higher expenditure because of the focus on improved crop and pest management, while Program 1 is lower because of the difficulty of funding genetic improvement projects which will produce outcomes by 2002.

Attachment A also provides details of the amounts recommended for commissioned research and research related administration in both the PIERD and CP2002 budgets. These are \$0.72 million and \$1.70 million, respectively. In addition SRDC will continue to support activities which build strategic R&D capability in the industry in specific priority targets, although at a lower level than in previous years due to a general build-up of R&D capability over the past eight years. \$0.15 million is recommended in the PIERD budget for those activities in 1999/00 while \$0.29 million is recommended for postgraduate scholarships. A pilot program to award a small number of Honours scholarships was commenced in 1999 and will continue in 2000.

The investment by SRDC in supporting R&D infrastructure will continue in the PIERD budget in 1999/00 (Attachment A). A total of \$2.78 million is recommended to be provided to three organisations: The Bureau of Sugar Experiment Stations (\$2.5m), the Sugar Research Institute (\$0.12m) and the New South Wales Sugar Milling Co-operative (\$0.16m) to assist in the delivery of R&D.

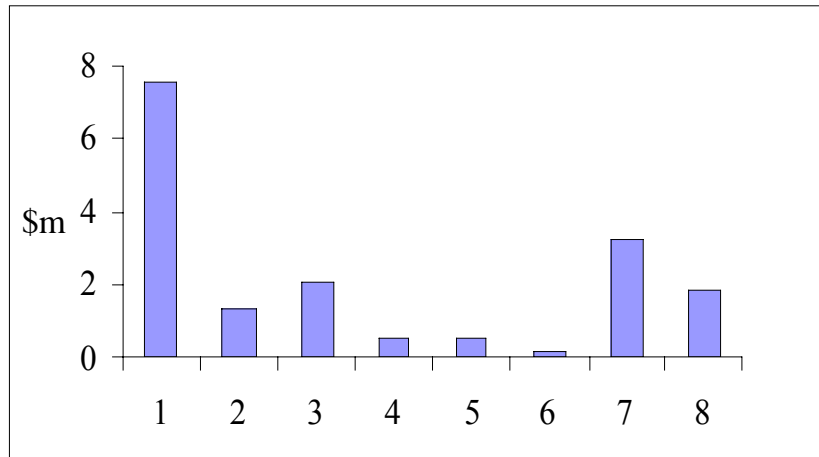
A summary of the funding of all activities, totalled over the PIERD and CP2002 budgets is presented in Figure 2, while total SRDC expenditure by major R&D providers is categorised in Figure 3.

**FIGURE 2 Proposed SRDC Total Expenditure 1999/00 (excludes contingency)**



		\$m	%
1	Continuing Projects	7.46	43
2	New Projects	3.31	20
3	Capability Building	0.15	1
4	Scholarships	0.29	2
5	Commissioned Research	1.78	10
6	Infrastructure	2.78	16
7	Research Administration	0.64	4
8	Operation of SRDC	0.81	5
		<u>17.22</u>	<u>100</u>

**FIGURE 3 Proposed SRDC Expenditure by Research Organisation and Other Activities 1999/00 (excludes contingency)**



		\$m	%
1	BSES	7.51	44
2	SRI	1.29	7
3	CSIRO	2.07	12
4	UQ	0.48	3
5	JCU	0.56	3
6	DNR	0.20	1
7	OTHER PROVIDERS	3.22	19
8	OTHER ACTIVITIES	1.89	11
	TOTAL	17.22	100

### Program Activities

Details of the activities and projects recommended for funding are discussed in CP2002 and in each of the eight Programs in the remainder of this section.

#### **CP2002 Accelerated Enhancement of Productivity and Profitability for the Australian Sugar Industry**

Considerable R&D has been completed or is currently in progress to address the major issues that contribute to below average productivity in significant industry regions. The additional resources allocated through this cross program activity provide an opportunity to enhance the current activity and significantly accelerate the identification of solutions to the benefit of the Australian sugar industry.

R&D projects with CP2002 funding are addressed within Programs 1, 2, 3, 4, 5 and 8 of the R&D Plan 1995–2000, according to priorities in the CP2002 Program Statement.

#### *Mission*

To improve industry profitability through accelerated achievement of objectives of existing programs with emphasis on sugar content, pest control, associated productivity issues and outcomes by 2002.

### *SRDC Goals for 1998–2002*

By 2002 it is expected that the expanded R&D Program will have:

- Used a participatory approach to identification, implementation and monitoring of R&D to increase the profitability of the sugar industry
- Enhanced the level of collaboration among research providers and sugar industry participants
- Enhanced the adoption of “best practice” by industry in all regions to improve viability of the sugar industry through increased productivity (yield and/or sugar content), reduced impact of pests, diseases and weeds, improved harvest/transport systems and return on investment by growers and mill owners
- Identified means of increasing sugar mill throughput without significant capital investment
- Demonstrated increased profitability over the base line established at the commencement of the project in priority issues and/or regions.

### *Strategies*

*Strategy CP2002.1 To create, manage and report on an additional Program to improve the viability of the sugar industry*

A Program Manager, based in north Queensland, was appointed to implement the expanded R&D program in August 1998. In addition, an Advisory Committee of industry representatives was appointed to provide input on the allocation of the additional funds and a number of Consultative Committees were established to work with the Program Manager and the Advisory Committee in identifying priority R&D needs on an issue or regional basis.

*Strategy CP2002.2 To adopt a participatory approach to the identification of needs for and implementation of R&D*

Sugar industry representatives and research providers have been involved in identifying, implementing and monitoring the additional R&D activities which include grower-managed on-farm R&D.

*Strategy CP2002.3 To fund additional R&D projects, directed at specific Long Term Objectives, Strategies and Goals in the SRDC R&D Plan 1995–2000*

Activities within this strategy are outlined within Programs 1–5 and 8.

*Strategy CP2002.4 To commission relevant R&D activity*

R&D commissioned under this strategy is discussed within Programs 1–5 and 8.

*Strategy CP2002.5 To provide infrastructure support*

Infrastructure provided under this strategy is discussed in Program 1.



## **Program 1 Plant Improvement**

Production of improved varieties requires development and application of improved technologies allowing greater understanding and manipulation of biochemical and physiological processes and access to new genes and parents. Industry profitability and both farm and mill management will be improved by shorter breeding cycles, more critical evaluation of varieties, enhanced resistance to pests and diseases, improved quality characteristics and by the presentation of better information to producers and processors on the adaptation and other characteristics of varieties.

The long-term objectives for Program 1 are:

To use plant improvement to increase net returns to the industry by developing and releasing varieties that:

- Produce higher yields of sugar with quality desired by the market
- Are more tolerant of biophysical and environmental constraints
- Are readily adopted by producers and millers.

### *SRDC Goals for 1995–2000*

By 2000, it is expected that R&D will have:

- Maintained potential sugar yield increases due to genetic improvement at 1% per year
- Increased the number of profitable ratoons grown with new varieties
- Introgressed new characteristics from related species and genera into the core programs
- Reduced the ‘time to release’ of varieties
- Increased variety use in integrated management systems
- Released genetically engineered varieties as parents and/or commercial clones
- Routinely induced and manipulated flowering for use in breeding.

### *Strategy 1.1 To understand and incorporate genetically controlled mechanisms*

New and continuing projects are examining various aspects of genetic transformation of sugarcane, with emphases on identifying suitable genes and improving the stability of expression of introduced genes. Continuing projects are investigating gene promoters from several sources including viruses, to ensure that introduced genes are expressed. Work will continue on an alternative transformation system using *Agrobacterium*, and advances in meristem transformation in an endeavour to avoid the problems of collateral damage in the current microprojectile systems.

Work will also continue to prepare a sugarcane gene bank, containing sequences and clones of expressed genes of sugarcane for application in gene isolation, changed gene regulation and genetic marker research.

Projects on field testing of sugarcane clones transformed to incorporate coat protein mediated resistance to Sugarcane Mosaic Virus (SCMV), and antimetabolites effective against canegrubs, will conclude and be written up

in 1999/00. A new project will continue to develop transgenic lines with resistance to canegrubs.

Two projects endorsed by the International Consortium for Sugarcane Biotechnology will be supported. One will investigate genetic diversity within Sugarcane Yellowleaf Luteovirus, and the other will continue work on sources of rust resistance.

*Strategy 1.2 To increase the range and use of parents*

Two continuing projects in this strategy aim to identify clones with high ratooning ability under green cane trash blankets in cooler southern environments, and to develop a strategy for selection of high CCS varieties for high fertility environments in northern growing districts.

A major project to develop the strategic capability of the sugar industry in the physiology of sugar accumulation will conclude in June 1999. Follow-up work will focus on improving sugar accumulation by transferring desirable traits from wild relatives of sugarcane.

One continuing project is funded from CP2002 in this strategy. In 1998/99, CP2002 funds were used to duplicate the photoperiod facilities at the BSES Meringa Experiment Station. This will provide plant breeders with more extensive facilities in which to induce flowering of parental clones and ensure that the most appropriate crosses are made. The continuing project will use this facility to accelerate the production of progeny from high-CCS clones adapted to the wet tropic environment.

*Strategy 1.3 To improve and accelerate the selection and characterisation of new varieties*

Continuing projects in this strategy address issues relating to conventional breeding as well as seeking to improve the selection process via gene marker technology.

Continuing and new projects focussed on the efficiency of the field selection process will address optimal field design and the effectiveness of statistical analysis techniques. CP2002 funding will provide a full-track weigh bin for sites in southern Queensland and NSW. This will avoid loss of trials due to poor wet weather access.

The continuing project to evaluate selection strategies and genotype and environment interactions across all Australian sugar-producing regions, will move into a field trial phase in 1999/00.

Gene markers are being utilised in several projects to map linkages of genes for key traits including disease resistance and control of flowering. Comparisons are made with maps in other grass crop species. A collaborative program between Australian and overseas laboratories to develop a library of microsatellite markers is also continuing.

A project to assess the use of markers in selection, using rust resistance as the target trait, will be extended into 1999/00 because of limited rust expression in the early years of the project.

Three new projects will also focus on aspects of marker technology. The first will maintain and characterise two mapping populations developed in previous projects. The second will assess the use of marker-assisted selection to introduce new genes from *Saccharum officinarum*. The third will test the “candidate gene” strategy to identify markers for desirable traits.

*Strategy 1.4 To increase the rate and extent of uptake of new varieties*

Continuing projects in this strategy are seeking to develop varieties with high CCS early in the harvest season, and to incorporate resistance to canegrubs into commercial varieties.

A long-term project which commenced in 1998/99 to screen Australian clones in Indonesia for tolerance and/or resistance to sugarcane smut was accelerated after the discovery of smut in the Ord in July 1998. Lines identified with resistance will be used as parents in the Australian breeding program.

A new project commenced with CP2002 funding will develop a best-practice package for the selection and optimum management of varieties for specific locations.

*Strategy 1.9 Travel*

Two travel grants have been approved for 1999/00. Support will be provided for Associate Professor Robert Birch, University of Queensland, to attend the International Symposium on Plant Genetic Engineering in Cuba in December 1999.

Dr Lynne McIntyre, CSIRO Tropical Agriculture, will visit CIRAD in France to continue collaborative work on mapping of the sugarcane genome.

## **Program 2 Crop Management**

Average sugar yield per hectare has increased over the last five years, following an extended period of static yields. It is likely that the use of superior varieties and improved crop management practices during the yield plateau was offset by the introduction of mechanical harvesting, the use of heavy in-field transporters as well as by deleterious biological and chemical effects that are arising after decades of sugarcane monoculture. Sustained profitability requires continual improvement in soil fertility and crop management while maintaining the natural resource base of the industry.

The long-term objectives for Program 2 are:

- To improve farm productivity through enhanced management practices and farming systems
- To enhance the industry’s productive capacity and maintain the natural resource base
- To increase the adoption of profitable, more sustainable crop management practices.

### *SRDC Goals for 1995–2000*

By 2000, it is expected that R&D will have:

- Maintained potential sugar yield increases due to improved agronomic practices at greater than 1% per year
- Improved the efficiency of water use in irrigated production systems, with irrigation scheduling and tailwater recycling having become accepted practices
- Encouraged the industry to utilise trash management/reduced tillage farming systems linked with green cane harvesting wherever appropriate
- Improved profitability through acceptance and ready application of farm business management principles and comparative performance analysis
- Utilised multidisciplinary R&D to achieve adoption of technology to address issues such as dirt in the cane supply and yield decline on an industry wide basis.

#### *Strategy 2.1 To develop sustainable crop management practices*

Studies into high density planting will continue with existing and new projects in 1999/00. The new project to be commissioned and funded in Programs 2 and 4, is an outcome of a review held in 1998 and will conduct demonstration trials across the industry.

A large project is underway in North Queensland to determine factors causing losses of yield and CCS in large, lodged crops. The impact of lodging on suckering and stalk death is being investigated. A related project is investigating the impact of nitrogen management on CCS in the wet tropics.

This area of research has been substantially boosted with two CP2002 projects which commenced in January 1999. The first will seek to further the understanding of why field CCS is not realised commercially and provide a basis for the development of remedial strategies. The second project will consolidate and coordinate research in a number of current projects on the environmental causes for sugarcane suckering in the wet tropics. The desired outcome is the development of crop management and crop improvement strategies to address problems caused by suckering.

A continuing project will seek to combine soil and plant nutrient data in databases owned by Incitec Pty Ltd and BSES, to investigate trends in fertiliser recommendations and soil nutrient levels. Work will continue to enhance nitrogen management by monitoring N content of cane juice at the mill. This work will be expanded with CP2002 funding to investigate the impact of N nutrition on CCS and apply N analysis results to on-farm practice.

Two other new CP2002 projects will focus on aspects of sugarcane nutrition. A project through the CRC for Sustainable Sugar Production will prepare a nutrient management package based on regional soil properties. The second project will investigate aspects of silicon nutrition in the wet tropics, where silicon deficiency has been linked to reduced yield and CCS.

A small new project will produce risk maps of phosphorus loss for soils of the Herbert Valley, based on the results of an earlier project.



Two continuing projects are examining aspects of green cane trash blanketing: its short and long-term impacts on soil fertility, and options for cooler and wetter areas where trash blanketing is associated with slow ratoon growth.

Existing projects are examining issues relating to irrigation and drainage of sugar lands, including risk management strategies for water use and their impact on profitability. Irrigation management is also being studied in the Ord River Irrigation Area, and this project has been expanded to contribute to an Industry Development Officer position in the Ord.

Continuing projects are examining the amelioration of acid and sodic soils by various management strategies, including the impact of trash retention on the management of acid and sodic soils. A project jointly funded by GRDC will examine strategies to reduce cadmium accumulation in grain legume crops grown in rotation with sugarcane. Work will also continue on strategies to minimise the effects of soil compaction resulting from traffic of farm machinery.

*Strategy 2.2 To improve plant establishment, fertiliser placement and trash handling abilities*

Work will conclude on a project to develop an improved applicator and controller for fertiliser application. A major continuing project will examine all aspects of the billet planting system, including development of equipment to harvest, treat and plant billets accurately to ensure optimum germination and emergence.

*Strategy 2.3 To reduce production costs per tonne of sugar per hectare per year*

The project to develop industry capacity in farm business management concluded in December 1998, and a new project began in January 1999.

Projects facilitating the adoption of improved technology and use of decision support systems will continue in relation to sustainable canefarming systems, best-practice irrigation, furrow irrigation efficiency and the use of district productivity data. Work will continue to collate 16 years of work on soils of the Herbert River district to produce a reference booklet on nutrition management of sugarcane.

One new and three existing projects will be funded through CP2002 in this strategy. The analysis of productivity trends in the wet tropics will continue, along with work to identify factors that limit cane farm productivity and profitability in the Innisfail district. This will then be used in district extension work to improve farm profitability. The third continuing project will benchmark the performance of up to 50 growers in the wet tropics and improve their financial performance.

The new project will investigate constraints to productivity and profitability in the Babinda area, with on-farm demonstration areas of recommended best practice.

*Strategy 2.4 To introduce sustainable production systems compatible with environmental and natural resource management*

Support funding will continue for the CRC for Sustainable Sugar Production, based at James Cook University (see Strategy 6.1), and for Phase 2 of the Yield Decline Joint Venture (see Strategy 3.3).

*Strategy 2.9 Travel*

Support will be provided for Mrs Sue Berthelsen, CSIRO Land and Water, to attend the International Conference on Silicon in Agriculture in Florida in September 1999.

**Program 3 Crop Protection**

The economic impact of pests and diseases on Australian sugarcane production appears to be relatively less than that on many other agricultural crops, and especially those in tropical environments. The variation across districts and from year to year is, however, large so that local impacts may be very high in some locations and years. In particular, greyback canegrubs have caused serious losses in the Burdekin district over the last five years, and their control is a specific focus of CP2002.

Direct costs of pests, weeds, and diseases result from both their impact on sugar production and the costs of control measures such as insecticides, fungicides and herbicides; the costs of prophylactic treatments; and the costs of quarantine.

The long-term objectives for Program 3 are:

- To minimise economic losses to sugar producers resulting from pests, weeds and diseases
- To develop integrated pest management (IPM) strategies that reduce the reliance on agricultural chemicals
- To develop techniques for producing disease-free propagation material to allow the safe transfer of sugarcane germplasm and varieties.

*SRDC Goals for 1995–2000*

By 2000, it is expected that R&D will have:

- Developed appropriate systems for monitoring pest, weed and disease incidence and begun using them to prioritise R&D efforts in crop protection
- Developed monitoring procedures and a good biological understanding for canegrubs, evaluated potential pathogens and other alternatives for their control, and begun developing IPM programs
- Identified and prioritised other pest, disease and weed problems warranting the development of IPM programs, and begun their development
- Developed an understanding of the role of pests and pathogens in yield decline, and, if appropriate, begun the evaluation of possible control measures
- Developed and implemented techniques which allow the safe exchange of germplasm.

*Strategy 3.1 To develop effective IPM programs targeting high-priority pests, weeds and diseases, and to ensure that control measures applied throughout the industry are cost-effective*

One estimate indicated that the economic impact of weeds on the Australian sugar industry is greater than that of both pests and diseases. Work will continue in a project to develop a methodology to aid decision making on herbicide use for Australian canegrowers.

Canegrubs are the most important insect pest of sugarcane in Australia, and their control has become increasingly difficult in some districts. SRDC is funding a number of continuing projects to find long term solutions for their control. These include the development of the fungus *Metarhizium* as a biological control agent, and an investigation of the effect of farming practices on canegrub populations.

Other canegrub projects are investigating the use of trap crops to manipulate adult greyback canegrub behaviour, and the biology of *Rhopaea*, the major canegrub genus in NSW and southern Queensland.

Three canegrub projects are underway with CP2002 funding. Two aim to enhance current projects in which biocontrol agents for greyback canegrub were developed. The first will investigate practical and economic issues related to using a microsporidian protozoan for grub control. The second will develop practices required to maintain the *Metarhizium* fungus in canefields following its application for canegrub control. This will be crucial in maximising the effectiveness at minimum cost of *Metarhizium* applications.

The third is developing “best practice” for greyback canegrub control and will build on previous R&D addressing this issue. Several best management projects will be managed under the overarching “best practice” project funded through CP2002 in Program 8, including one focusing on the management of weevil borers in the wet tropics.

The fifth CP2002 project in this strategy will be aimed at increasing the adoption of IPM in the sugar industry through the appointment of a coordinator to be based at Mackay in Central Queensland. The impact of this investment to underpin the development of IPM should continue after the completion of CP2002.

The increasing importance of soldier fly is also recognised through inclusion of control of this pest in the *Metarhizium* project, as well as a continuing project to develop an IPM system for soldier fly control.

A new project will investigate the biology of and possible management strategies for *Rhyparida morosa*, an insect causing increasing damage in the Isis and Bundaberg areas in recent years.

Ratoon Stunting Disease (RSD) is one of the most serious sugarcane diseases in Australia. A project commenced in 1998/99 to follow on from earlier work to seek control techniques by characterising pathogenicity genes in the causal organism, *Clavibacter xyli* ssp *xyli* (Cxx). A related new project in 1999/00 will provide supplementary funding for an ARC studentship to investigate the genetic diversity of Cxx.

A new project will support an international collaborative effort based in the UK to investigate the taxonomy of the sugarcane downy mildew fungus.

A program of variety introduction into the Ord River Irrigation Area will continue with material being tested for agronomic and pest resistance attributes. A small program of screening lines in the Ord for resistance to sugarcane smut will commence in July 1999, in conjunction with the screening work in Indonesia funded through Program 1. A continuing project in northern Australia will develop diagnostic tests and monitor the incidence of several diseases believed to be caused by phytoplasmas.

*Strategy 3.2 To better prioritise R&D effort*

An Australia-wide collaborative project to prepare a CDROM database of identification and control measures for plant-parasitic nematodes will continue.

SRDC's third project developed in response to the discovery of sugarcane smut in the Ord in July 1998, in addition to the screening projects in strategies 1.4 and 3.1, will provide funding support for a survey of sugarcane farms in eastern Australia which commenced in January 1999.

*Strategy 3.3 To understand and ameliorate the yield decline phenomenon*

Phase 1 of the Sugarcane Yield Decline Joint Venture will conclude in June 1999 and funding has been approved for a second phase. This is a major collaborative activity involving BSES, CSIRO Land and Water, QDPI and QDNR. Funding is spread over Programs 2 and 3, and Phase 2 funding will also be spread over the PIERD and CP2002 budgets. Key issues addressed in this strategy are interactions between crop cycles and pest and disease incidence. CP2002 funding will be focusing on the impact of nematodes on sugarcane growth.

A continuing project associated with the Yield Decline Joint Venture is examining progressive changes in soil biology and chemistry as the length of time under continuous sugarcane increases.

*Strategy 3.4 To develop methodologies for the safe exchange of germplasm*

The exchange of germplasm between regions within Australia and between Australia and other countries is threatened by the occurrence of a range of diseases and difficulties with their detection. A continuing project is addressing the diagnosis of sugarcane pathogens to ensure safe germplasm movement. Another is using the extensive research already conducted into sugarcane pathogen diagnostics to upgrade sugarcane quarantine to a state of best practice.

*Strategy 3.9 Travel*

Support will be provided for Ms Nicole Thompson to present the results of her PhD project on sugarcane striate mosaic virus to the 11<sup>th</sup> International Congress of Virology to be held in Sydney in August 1999.



#### **Program 4 Cane Harvesting and Transport**

Increasing crop size, green cane harvesting and the trend to rationalisation within the harvester sector, reducing the number of harvester groups and increasing the yearly tonnage per group, has put considerable pressure on this sector of the industry. In response harvester rate and power have increased significantly over the last few years and this has led to a reduction in cleaning efficiency and an increase in dirt and extraneous matter, an increase in cane ratoon damage and lower transport efficiency due to the lower bulk density of high trash cane.

Green cane harvesting now exceeds 61% across the industry, despite there being significant areas where the practice has not yet proved successful due to reduced cane vigour under green cane trash blanketing in wet or cold conditions. The heavier green crops in most areas are also proving difficult for current harvesters to gather and cut effectively and efficiently.

Increased emphasis on sugar quality is promoting the discussion of cane quality and gradually leading to changed practices and procedures which will over time reduce the cost of the harvesting and transport sector. This is still the area of highest cost associated with sugar cane production and an area where research and development should be able to assist with change.

The long term objectives for Program 4 are:

- To minimise dirt and other extraneous matter in the cane supply
- To improve the efficiency and reduce the cost of the harvest/transport system
- To expand the capacity for and application of green cane harvesting
- To expand the adoption of best practice harvesting and transport technology.

#### *SRDC Goals for 1995–2000*

By 2000, it is expected that an increased R&D capacity to address cane harvest and transport issues will have been developed, and that R&D will have:

- Developed cleaning systems which reduce cane losses by 1% and which reduce the quantity of extraneous matter, including dirt, by 3% in cane harvested green
- Reduced overall harvesting and cane transport costs
- Developed practices which help control soil compaction during harvest and in-field transport of cane
- Identified the barriers to adoption of extended harvesting hours.

#### *Strategy 4.1 To reduce cane losses, stool damage and extraneous matter*

A continuing project funded from CP2002 is developing and improving the Jetclean harvest cleaning system devised in a previous SRDC project, while SRDC has commissioned a feasibility study with CP2002 funding to evaluate options for a secondary cane cleaning plant. In addition, a project directed at a light weight elevator and advanced secondary cleaning system for harvesters will continue in 1999/00. A continuing project investigating novel basecutter designs and cane feeding is to be complemented by a new project which will place more emphasis on a basecutter design which minimises dirt in the cane supply.

The increasing difficulty being experienced with high levels of extraneous matter and dirt has placed considerable emphasis on education and extension of best practices. A continuing extension project has demonstrated interesting interactions between cane loss and cane cleaning and this will result in improvements not only to harvester design but to best practice in harvesting. A complementary continuing project is extending this work and concentrating more on the dirt being introduced and ways to minimise it.

An investigation into novel basecutter designs and cane feeding is continuing in 1999/00 and will be complemented by a new project using close-range, microwave radar for automatic control of base-cutter height and other harvester operations.

*Strategy 4.2 To expand the application of green cane harvesting*

Problems associated with gathering and feeding of, and harvester guidance in, green cane are proving difficult to solve. The extremely dense foliage in heavy green cane causes traditional methods of control used in other crops to not work in these conditions. Projects are continuing on improving the feeding of harvesters in green cane crops as well as the cleaning of the large amounts of extraneous matter introduced as a result of green cane harvesting.

Steady progress is being made in continuing projects on reliable crop divider height control and harvester guidance. A new project funded through CP2002 will undertake commercial implementation of the crop divider height control system.

*Strategy 4.3 To improve the efficiency and reduce the cost of harvesting and transport*

A project on upgrading load and speed limits for cane transport vehicles has been extremely successful. Excellent cooperation from all sectors of the industry and also the Department of Transport has allowed accurate testing and recording of actual cane vehicle information as operated. This is enabling better and more appropriate regulations and guidelines for cane vehicles with improved load and speed limits.

GPS (Global Positioning Systems) has made major inroads into field and transport operations with many locomotives, cane vehicles and harvesters being fitted out. A project integrating the information from these devices into the existing tools used by mills to schedule and control the transport and harvesting in local areas has been completed and a continuing project is introducing the software ToTools into traffic offices for control of locomotives.

A continuing project funded through CP2002 to achieve best practice in harvesting directly addresses the long-term objective of Program 4 to expand the adoption of best-practice. This like other best practice projects is being managed under the umbrella project MA001 in Program 8.

A new CP2002 project to commence in July 1999 will develop a model of the economic impact of extraneous matter components on the sugar industry.

*Strategy 4.4 To expand the infrastructure available for solving harvesting and transport problems*

There are currently no projects directly addressing this strategy although several projects have components which indirectly address the areas covered.

*Strategy 4.5 To minimise the adverse environmental effects of harvesting and transport*

A project studying soil compaction from harvesters and heavy haulouts will be completed in 1999. Results will enable better management of the problem, improving the profitability and sustainability of cane production.

*Strategy 4.9 Travel*

During 1999/00 Mr C Norris of BSES will travel to USA, Germany, Colombia, Brazil and Argentina to evaluate alternative harvester technologies, with emphasis on heavy green crops.

## **Program 5 Sugar Manufacture**

The high cost of new milling capacity and declining sugar prices are inhibiting investment in new plant. Research and development is focussed strongly on low capital cost improvements and potential further cost reductions in operating, maintenance and administration. Investigations of processes or equipment with the potential to improve rate at relatively low cost are of top priority.

As a result considerable effort is being directed into innovative processes and fundamental modelling of existing processes in order to understand them better. Much of the mathematical modelling being done is at the cutting edge of the technology world wide and this is generating a pool of world class knowledge for the industry.

The large quantity of bagasse and other potential by-products generated in sugar processing are of potential value and benefit to the industry if markets could be found for them. To date no significant breakthrough has been achieved in this area other than the use of bagasse for cogeneration of electricity.

The long term objectives of Program 5 are:

- To reduce the unit cost of raw sugar production through better use of existing capital and capacity, and through existing and new technology
- To develop value adding and alternative uses for sugar, sugarcane and their by-products.

### *SRDC Goals for 1995–2000*

By 2000, it is expected that R&D will have:

- Facilitated the introduction of innovative equipment designs to meet market needs and where capacity expansion has been necessary
- Provided opportunities to expand existing capacities by the application of advanced modelling and control systems

- Assisted with the development and widespread adoption of automated on-line analysis systems for cane payment and factory process streams
- Improved the technological potential for increased recovery of sucrose from cane
- Provided mill owners with management tools for more cost-effective maintenance and operations management
- Developed and evaluated a range of alternative use and value adding options for cane, sugar and associated by-products.

*Strategy 5.1 To improve the economics of sugar mill processing*

A significant part of the budget in this area is on mathematical modelling of equipment and processes. This has only been possible in more recent times, primarily as a result of the greater availability of larger, faster, low-cost computers. A very successful project using these techniques finished in 1998 and demonstrated how the throughput of juice clarifiers could be significantly improved at very little cost and with no loss of performance. A continuing project funded through CP2002 is aimed at further improvement in mud removal from the SRI clarifier while a new project will commence fundamental studies on the chemistry of clarification.

Other continuing projects are using finite element techniques to model the feeding of sugarcane and the extraction of juice in milling units. This has proved extremely complex and difficult but is at last showing results that are considered generally consistent with expectations. A project which commenced in 1998 to empirically model the reabsorption phenomenon in milling will not only validate much of the modelling but will generate information of great benefit to these other models. As the modelling and validation continue our confidence and understanding of the processes involved in milling will improve and, it is expected, allow novel processes to be developed.

A project funded through CP2002 to increase milling unit capacity will continue in 1999/00. In addition a new project involves an experimental and numerical investigation to improve the dewatering of prepared cane and bagasse.

There are three continuing projects investigating pan control, circulation and crystallisation. One is a fundamental attempt to mathematically model the circulation and crystallisation in vacuum pans. The results of this will not only help our understanding of the crystallisation process but allow improved pan design through mathematical modelling. Another project is modelling the control of batch pans in an attempt to improve the throughput and quality while the third project is looking at fundamental aspects of crystal growth to try to understand and exploit variations in growth rate.

Impurity removal and control is a very important part of the process and several projects are directed to this. Continuing projects are investigating the formation of oxalic acid in the process with the aim of eventual control and reduction in scaling in process vessels, and the development of new polymer additives for impurity removal.

A continuing project funded in CP2002 aims to improve monitoring and control of batch fugals. A new project will investigate the potential for storage of pan stage materials for later processing.

Projects will commence in 1999/00 to apply membrane filtration for pan stage capacity increase and improved sugar quality. Improvement in the rate of the pan stage process is the aim of a new project applying mathematical modelling to investigate boiling in calandria tubes. A new project funded through CP2002 aims to improve the purging and washing efficiency of continuous high grade fugals.

Extraneous matter and dirt in cane are major problems to the industry. Rapid, accurate feedback is necessary if the level of both extraneous matter and dirt in the cane supply are to be controlled, but up until now there has been no reliable on-line measurement technique. A project using near infra-red imaging to detect both extraneous matter and dirt will continue in 1999/00.

The need for increased rate is not only causing difficulties in processing but also at the boiler station. Steam demand is rising while at the same time the quality of bagasse, particularly moisture, is deteriorating from increased rate through the mills. A continuing project is examining an advanced bagasse feeder to improve the stability of boiler firing and enable increased steaming rates from the boilers. A new project funded in CP2002 is developing an advanced secondary air system for increased furnace firing capacity and boiler steam capacity.

#### *Strategy 5.2 To increase the revenue base from sugarcane processing*

A study into spontaneous combustion of large bagasse stockpiles has proved difficult but is continuing and will be of considerable benefit to mills needing to store large quantities of bagasse during the off-season for co-generation of electricity or for other potential future uses.

The project which commenced in 1997 on the use of bagasse as a feed stock for activated carbon is expected to be completed in 1999/00.

### **Program 6 Environmental and Natural Resource Management**

The environmental issues subject to R&D within this program are primarily related to off-farm and off-mill effects and the long-term aspects of maintaining the natural resource base. Hence most of the R&D in this program is aimed at broader public benefits.

The successful adoption of environmentally sound practices must be linked to maintenance of profitability for the grower and miller. This is consistent with the definition of sustainability developed by the Standing Committee on Agriculture which involves the following three components:

- Increased financial viability (this may involve additional costs at some stage)
- Maintenance of the natural resource base
- Minimising the impact on other ecosystems.



The long-term objectives for Program 6 are:

- To develop effective management practices which minimise the off-site environmental effects of the sugar industry
- To develop effective management practices which sustain the productive and environmental values of water and soil resources
- To improve health and safety in the workplace.

*SRDC Goals for 1995–2000*

By 2000, it is expected that:

- Information on nutrient and pesticide loss and movement in the Herbert and South Johnstone catchments will have been applied to other similar catchments to reduce environmental effects and decision support tools developed will have been utilised widely
- The use of green cane harvesting will have been expanded by the removal of current constraints to adoption
- The industry will have achieved total compliance with all relevant legislative requirements.

*Strategy 6.1 To understand the mechanisms, paths and impacts of nutrient and chemical losses*

Continuing projects in this strategy will monitor pesticide residues and examine loss patterns of nutrients and pesticides from individual fields in relation to nutrient and pesticide application, and investigate nitrate levels deep in the soil profile and in groundwater. One project investigating pesticide movement in soils has been extended for 12 months from December 1999.

Another project in this strategy is investigating impacts of sediments and nutrients from canefields on the ecology of freshwater streams, under peak and normal flow circumstances. A new project will examine the impact of farm management practices on water quality in caneland drains in NSW.

The commitment of the sugar industry to issues of ecologically sustainable development is reflected in the allocation by SRDC of an annual cash contribution (\$107,700 in 1999/00) to the Cooperative Research Centre (CRC) for Sustainable Sugar Production. As well, projects totalling at least \$500,000 per annum are funded within CRC programs. The actual funding for CRC-sponsored projects in 1999/00 will be \$664,000.

*Strategy 6.2 To reduce the losses of nutrients and chemicals and sustain the land and water resource*

Green cane trash blanketing is a management strategy which assists in reducing runoff and nutrient and chemical loss. Over 60% of the industry has adopted green cane harvesting. Reasons why the level of adoption is not higher in the Burdekin and central Queensland are being investigated in a socio-economic study of harvesting residue retention systems funded jointly by SRDC and the Land and Water Resources R&D Corporation. A related project is seeking to involve key stakeholders in determining optimum nutrient management strategies for each of the major sugarcane growing districts.

A continuing project in central Queensland will assist in the development of a water resource management strategy for the Mackay coastal aquifer system where water extraction for irrigation has been restricted because of concerns with salt water intrusion from the sea. A new project based in the Clarence Valley of NSW will examine the impact of floodgate management on sugarcane production. This is part of a consortium of projects on floodgate management supported by the Fisheries and Land and Water Resources R&D Corporations, and ASSMAC (the NSW Acid Sulphate Soil Management Advisory Committee).

The potential problems associated with the use of acid sulphate soils for crop production are also being addressed in a continuing project in southern Queensland aimed at prediction and management of acid production and export from acid sulphate soils used for sugar cane growing.

Another continuing project will seek to quantify sources of nutrient and sediment in runoff from cane farms and develop whole farm sediment budgets as an aid to minimising sediment and nutrient loss.

Work will continue to define and promote best management guidelines for sustainable sugarcane farming in the Johnstone River catchment. A new project in collaboration with Canegrowers and government agencies will develop an extension program to provide specific guidelines for the implementation of the Code of Practice for Sustainable Cane Growing in Queensland, which was released in 1998.

*Strategy 6.3 To reduce the environmental impact of sugar manufacturing operations by the development of sustainable practices and processes*

A project will continue to investigate the microbiology of sugar mill cooling towers and spray ponds, with an emphasis on the incidence and control of *Legionella*.

*Strategy 6.4 To establish effective links between R&D activity related to environmental and natural resource management conducted outside of this program*

Two projects which commenced in 1998/99 in this strategy are examining issues related to land management planning. A major project in collaboration with the CRC for Sustainable Sugar Production and the Land and Water Resources R&D Corporation will develop analytical tools and improved collaborative approaches for integrated resource use planning in the Australian sugar industry. The second project will develop a methodology to assess land resources of potential expansion areas, and will test the approach in selected areas of the Herbert catchment.

*Strategy 6.5 To improve the occupational health and safety environment of sugar industry personnel*

A new project will develop a video-based Code of Practice and guidelines for mill locomotives and cane harvesting and haulout equipment operating in shared workplaces.

## **Program 7    Enhanced Marketability**

Australia has a reputation for being a reliable supplier of high quality raw sugar. Overseas producers are continually improving their performance and in some cases testing the market with new forms of raw sugar as in the case of Brazil with its low colour sugar. With 85% of total production exported it is important not only to maintain our quality but also to be prepared to meet new product specifications should these result from overseas competition. In this way the industry will be able to maintain its preferred supplier status in major markets.

The long term objectives of Program 7 are:

- To enhance the marketability of sugar by further developing the industry's high reputation for responsiveness to consumer requirements
- To reduce the costs of sugar storage and delivery to customers, and to improve the operational efficiency of Australian marketing organisations.

### *SRDC Goals for 1995–2000*

By 2000, it is expected that:

- Australia's reputation as a reliable supplier of high quality sugar will have been maintained
- More information on customer requirements will have been provided to the producers and marketers of Australian sugar
- The scope for reducing the cost of delivering sugar to offshore customers will have been evaluated and exploited.

### *Strategy 7.1    To develop improved systems for the efficient and integrated management of sugar quality (as defined by customers)*

Projects within this program are aimed at measuring or reducing the impurities found in raw sugar, reducing crystal colour and production of high pol sugar.

Two continuing projects and a new project to commence in 1999/00 are investigating genetic, environmental and ecological factors affecting impurity levels in sugar with the aim of eventually controlling them at source. Another two continuing projects are looking at novel measurement techniques to quantify impurity levels.

Two continuing projects are concerned with improving the colour characteristics of Australian raw sugar. The first is comparing colourants in Australian and overseas raw sugar with the aim of identifying opportunities for improving the refining characteristics of Australian raw sugars. The second is testing the concept that reduced enzymic browning of sugarcane from transgenic cane juice will result in crystals of significantly lower colour.

A new project will commence in July 1999 to examine the costs and benefits of the CBA boiling scheme for high pol sugar production.

## **Program 8 Industry Competitiveness**

The competitiveness of the Australian sugar industry and the contribution which it makes to the overall Australian economy are affected by decisions related to issues such as the regulatory structure of the industry; the rationalisation of industry infrastructure through adjustment of farm and/or mill size; the interaction between the industry and the broader community; extension methodologies and techniques, and the flow and use of information within the industry and the community. Industry competitiveness is also increasingly affected by urban encroachment and competing uses for productive sugar growing land.

The long-term objectives for Program 8 are:

- To improve decision making processes for the benefit of the sugar industry and the wider Australian community through the analysis and provision of information on issues affecting overall industry competitiveness.
- To enhance market access and penetration of the sweetener market.

### *SRDC Goals for 1995–2000*

By 2000, it is expected that R&D will have assisted decision making on:

- Industry structures, interrelationships and information flows which maximise the sugar industry's international competitiveness and contribution to the wider Australian community
- Government regulations which minimise impediments to industry performance and efficiency
- Extension methodologies and technology transfer systems which achieve faster and wider adoption of R&D.

### *Strategy 8.1 To improve industry competitiveness*

SRDC's support for the Australian Rural Leadership Program and the development of the Australian Rural Research in Progress Database will continue in 1999/00.

Two projects addressing the important area of enhanced technology transfer within the canegrowing sector of the industry will also continue. The first is aimed at enhancing the marketing skills of technology transfer personnel and the second will use CD ROM technology to raise awareness of pests and diseases as yet not known in Australia. The availability of the completed CD-ROM will enable early identification of newly introduced pests or diseases and thus ensure rapid response by relevant agencies to limit the damage that might result. In addition a new project to develop a best practice resource package for greyback canegrub will commence with CP2002 funding in July 1999.

A project to evaluate how improvements can be made to whole of industry profitability based on enhanced communication between industry sectors was commenced in April 1998 using the Rocky Point Mill Area as a pilot study. This will conclude in 1999/00. The more detailed project on cane supply options in Mackay will also continue and is complemented by a continuing CP2002 project which is developing user-friendly versions of optimisation

models already tested, and assist industry at district level to use them to evaluate alternative cane supply arrangements.

A project aimed at the application of seasonal climate forecasting to improve sugar industry competitiveness will continue in 1999/00. This project is funded jointly with the Land and Water Resources R&D Corporation as part of the Climate Variability in Agriculture Program.

International collaboration on systems approaches to profitable sugar production will be facilitated by a continuing project which commenced in July 1998. It provides a direct linkage and exchange of knowledge between South African and Australian scientists.

A growing awareness of the largely untapped resources of women in the sugar industry has led to funding for a new project to commence in July 1999. It will be a pilot study in the Herbert River District of North Queensland to conduct education programs for women and encourage participation in the industry at farm and organisational levels.

An overarching project on best practice, commissioned in 1998/99, will continue in 1999/00 in CP2002. This project ensures coordination of a number of best practice projects on variety choice in Program 1, canegrub and weevil borer control in Program 3, and harvesting practices in Program 4.

At the international level, SRDC intends to again cooperate with its key industry stakeholders and commission a project to capitalise on previous work which examined Australia's competitive position in the world raw sugar market.

**ATTACHMENT A**  
**1999/00 SRDC BUDGET**  
*(Estimated Crop Size 44mt, Levy Rate \$0.15)*  
 \$m

	Program								TOTAL
	1	2	3	4	5	6	7	8	
<b>INCOME</b>									
Industry Contribution									6.60
Commonwealth Contribution									6.00
PIERD Matching									4.36
CP2002									0.40
Interest/Other									0.40
<b>TOTAL INCOME</b>									<b>17.36</b>
<b>EXPENDITURE</b>									
<b>PIERD Program</b>									
Continuing Projects	1.21	1.43	0.81	0.35	0.41	1.03	0.47	0.31	6.02
New Projects	0.46	0.19	0.27	0.10	0.60	0.32	0.14	0.01	2.09
Capability Building	0	0.05	0	0.04	0	0.06	0	0	0.15
Scholarships/Augmentation Grants	0.07	0.07	0	0.06	0	0.06	0.03	0	0.29
Research Administration	0.06	0.05	0.03	0.05	0.03	0.04	0.02	0.02	0.30
Operation of SRDC	0.17	0.13	0.09	0.12	0.09	0.09	0.07	0.05	0.81
Infrastructure	0.60	0.46	0.32	0.43	0.30	0.32	0.21	0.14	2.78
Commissioned Research	0	0.12	0	0.20	0	0	0	0.10	0.42
Contingency	0.16	0.13	0.08	0.12	0.08	0.09	0.06	0.05	0.77
<b>Total PIERD</b>	<b>2.73</b>	<b>2.63</b>	<b>1.60</b>	<b>1.47</b>	<b>1.51</b>	<b>2.01</b>	<b>1.00</b>	<b>0.68</b>	<b>13.63</b>
<b>CP2002 Program</b>									
Projects	0.22	0.94	0.50	0.39	0.32	0	0	0.29	2.66
Research Administration	0.03	0.12	0.05	0.07	0.03	0	0	0.04	0.34
Commissioned Research	0.18	0.45	0.22	0.27	0.13	0	0	0.11	1.36
<b>Total CP2002</b>	<b>0.36</b>	<b>1.67</b>	<b>0.69</b>	<b>0.86</b>	<b>0.36</b>	<b>0</b>	<b>0</b>	<b>0.42</b>	<b>4.36</b>
<b>TOTAL EXPENDITURE</b>									<b>17.99</b>



**ATTACHMENT B**  
**1999/00 RESEARCH & DEVELOPMENT PORTFOLIO**  
**PIERD BUDGET**

Project	Title	Duration	Contact	Funds 1999/00
---------	-------	----------	---------	------------------

**Program 1 Plant Improvement**

***Strategy 1.1 To understand and incorporate genetically controlled mechanisms***

**CONTINUING PROJECTS**

BSS154	Field tests of SCMV resistant plants	Jul 96–Oct 99	Dr G Smith	\$6,500
BSS163	Canegrub anti-metabolites	Jul 96–Oct 99	Dr P Allsopp	\$6,000
BSS209	Meristem transformation for sugarcane genetic engineering	Jul 98–Jun 02	Dr G Smith	\$86,028
CTA027	Transformation of sugarcane using <i>Agrobacterium tumefaciens</i>	Jul 97–Jun 00	Dr C Grof	\$90,996
CTA035	A sugarcane gene bank	Jul 98–Jun 00	Dr J Manners	\$71,273
QUT002	Development of transformation cassettes for sugarcane	Jul 97–Jun 00	Dr R Harding	\$66,519
UQ022	Isolation of sugarcane gene promoters	Jul 96–Jul 99	Assoc Prof R Birch	\$5,000

**NEW PROJECTS**

BSS237	Identification of canegrub-resistant transgenic sugarcane lines for commercial evaluation	Jul 99–Jun 02	Dr P Allsopp	\$60,000
ICB005	Genetic diversity within Sugarcane Yellowleaf Luteovirus	Apr 99–Mar 01	Dr E Mirkov	\$20,000
ICB006	Map-based cloning of rust resistance in sugarcane	Jun 99–Jul 00	Dr R Wing	\$17,000

***Strategy 1.2 To increase the range and use of parents***

**CONTINUING PROJECTS**

BSS169	GxE interactions on ratooning of clones under trash blankets under cool/wet conditions	Jul 96–Jun 00	Dr T Bull	\$56,198
--------	--	---------------	-----------	----------

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
BSS179	Development of a strategy for selection of high-CCS cultivars for high fertility environments in northern Queensland	Jul 97–Dec 03	Dr N Berding	\$65,000

#### **NEW PROJECTS**

CTA048	The transfer of high CCS traits from wild relatives to sugarcane using biochemical markers	Jul 99–Jun 03	Dr C Grof	\$87,238
--------	--	---------------	-----------	----------

### ***Strategy 1.3 To improve and accelerate the selection and characterisation of new varieties***

#### **CONTINUING PROJECTS**

BSS138	Assessment of bulk segregant analysis and marker-assisted selection for economically important traits in sugarcane	Jul 95–Jun 00	Dr N Berding	\$20,000
CTA024	Map-based chromosome and trait tagging in sugarcane using cytological and RFLP markers	Oct 96–Sep 99	Dr L McIntyre	\$42,000
CTA028	Evaluation and re-structuring of regional selection programs to maximise efficiency and speed of cultivar release	Jul 97–Jun 03	Dr S Chapman	\$114,410
ICB003	Genetic and molecular analysis of Expression Sequence Tags (EST's) implicated in sugarcane growth and productivity	Jul 97–Jun 00	Prof A Paterson	\$13,000
SCU001	Characterisation of sugarcane microsatellites	Jul 97–Jun 00	Prof R Henry	\$136,213
UQ023	Optimisation of experimental design and analysis for variety trials to maximise genetic gain	Jul 96–Mar 00	Assoc Prof K Basford	\$12,500

#### **NEW PROJECTS**

BSS231	Development and application of spatial analysis to improve precision in selection trials	Jan 00–Dec 02	Ms J Stringer	\$14,500
CTA046	Perfect markers for sugarcane mapping	Jul 99–Jun 02	Dr L McIntyre	\$43,584
CTA047	Introgression of new genes from <i>Saccharum officinarum</i>	Jul 99–Jun 04	Dr P Jackson	\$106,402

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
CTA049	Characterisation and maintenance of the Australian sugarcane mapping populations	Jul 99–Jun 03	Dr L McIntyre	\$105,145

***Strategy 1.4 To increase the rate and extent of uptake of new varieties***

**CONTINUING PROJECTS**

BSS132	Plant resistance to canegrubs	Jul 94–Jul 00	Dr P Allsopp	\$20,145
BSS196	Selection and commercial use of early CCS varieties	Jul 97–Jun 01	Mr A Rattey	\$57,514
BSS214	Pre-emptive, off-shore screening of Australian germplasm for resistance to sugarcane smut	Jul 98–Jun 03	Mr B Croft	\$83,786

***Strategy 1.9 Travel***

**NEW PROJECTS**

CTA050	Enhancing collaboration between Australian and French sugarcane mapping activities	Nov 99–Feb 00	Dr L McIntyre	\$4,050
UQ036	Travel by Dr Robert Birch to International Symposium on Plant Genetic Engineering, CIGB, Cuba	Nov 99–Jan 00	Assoc Prof R Birch	\$6,809

<b>Other Projects</b>				\$252,850
<b>Total — Program 1 (Continuing Projects)</b>		<b>20</b>		<b>\$1,205,932</b>
<b>Total — Program 1 (New Projects)</b>		<b>10</b>		<b>\$464,728</b>
<b>Total — Program 1</b>		<b>30</b>		<b>\$1,670,660</b>

**Program 2 Crop Management**

***Strategy 2.1 To develop sustainable crop management practices***

**CONTINUING PROJECTS**

BSS137	Genotype selection and management strategies for exploitation of the responses to high planting densities	Jul 95–Jul 99	Dr T Bull	\$10,000
BSS143	Strategic tillage to reduce soil structural degradation and improve productivity	Jul 95–Jun 01	Dr M Braunack	\$62,298
BSS155	Factors affecting the residual value of lime	Jul 96–Jun 01	Dr G Kingston	\$43,000

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
BSS168	Sustaining un-burnt sugar production systems in cool and wet environments	Jul 96–Mar 00	Dr G Kingston	\$23,090
BSS180	Assessing clonal and nitrogen interaction on CCS in sugarcane in the wet tropics	Jul 97–Jun 00	Mr A Hurney	\$82,749
BSS181	Increasing sugarcane productivity through development of integrated surface drainage systems for low lying canelands	Jul 97–Jun 02	Mr J Reghenzani	\$103,730
BSS197	Products and mechanisms for amelioration of sodic soils	Jul 97–Dec 01	Mr G Ham	\$42,378
BSS198	Improving nutrition management and recommendations by analysing historical soil analysis databases	Sep 98–Dec 99	Mr G McMahon	\$20,824
BSS199	Improving the management of acid and sodic soils with green trash retention using calcium based ameliorants/products	Jul 98–Jun 01	Mr B Schroeder	\$70,540
BSS212	Investigation of the limits to high density planting	Jul 98–Jun 01	Dr T Bull	\$61,396
CSR022	Best-practice irrigation management to maximise profitability and ensure sustainability in the Ord sugar industry	Jul 96–Jun 01	Dr A Wood	\$122,656
CSR024	Improving the environment for sugarcane growth through the amelioration of soil acidity	Jul 96–Jun 01	Dr A Wood	\$39,136
CTA022	Short and long term impacts of green cane trash blanketing on soil fertility	Jul 96–Jun 01	Dr P Thorburn	\$97,598
CTA029	Monitoring cane at the mill to improve nitrogen management on the farm	Jul 97–Jun 01	Dr B Keating	\$77,993
CTA030	Overcoming constraints to high yield and CCS in large and lodged cane crops	Jul 97–Jun 01	Dr S Chapman	\$25,500
CTA038	Irrigation risk management strategies to reduce water use and maximize profitability: a paradigm shift in performance to \$ per unit of water.	Jul 98–Jun 02	Dr G Inman- Bamber	\$111,240

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
DPI013	Development of strategies to reduce Cd accumulation by grain legumes in sustainable crop rotations	Jul 98–Jun 01	Dr M Bell	\$30,000

#### **NEW PROJECTS**

CLW010	Risk assessment of phosphorus (P) in lower loss and guidelines for P use Herbert soils	Jul 99–Jun 00	Dr R Bramley	\$7,252
--------	--	---------------	--------------	---------

#### ***Strategy 2.2 To improve plant establishment, fertiliser placement and trash handling abilities***

#### **CONTINUING PROJECTS**

AR001	An improved applicator & controller for applying fertiliser to sugar cane	Jul 97–Jul 99	Mr I Grevis-James	\$1,000
BSS208	Improving planting systems for sugarcane	Jul 98–Jun 03	Mr B Robotham	\$128,118

#### ***Strategy 2.3 To reduce production costs per tonne of sugar per hectare per year***

#### **CONTINUING PROJECTS**

BSS135	Improved techniques for the development and extension of sustainable canefarming systems	Mar 95–Jun 00	Ms I Christiansen	\$0
BSS182	An integrated Decision Support System (DSS) to improve the utilisation of productivity data by extension, research and productivity programs	Jul 97–Dec 00	Mrs J Cox	\$40,000
BSS183	Statewide adoption of best irrigation practices for supplementary and full irrigation districts	Jul 97–Jun 00	Mr P Sutherland	\$108,465
BSS206	A participatory approach to improving furrow irrigation efficiency	Jul 98–Jun 00	Mr A Linedale	\$9,500
BSS217	Coordinated farm business management for the Australian sugar industry	Jan 99–Aug 02	Mr G McMahon	\$98,230
CSR026	A reference booklet for canegrowers on the nutrition and fertilizing of sugarcane for different soil types	Jul 98–May 00	Dr A Wood	\$25,000

Project	Title	Duration	Contact	Funds 1999/00
---------	-------	----------	---------	------------------

**Strategy 2.4 To enhance the quality of cane supply and reduce losses**

**NEW PROJECTS**

YDV002	Yield Decline Joint Venture Phase 2 (Part funding)	Jul 99–Jun 05	Dr A Garside	\$175,502
--------	--	---------------	--------------	-----------

**Strategy 2.9 Travel**

**NEW PROJECTS**

CLW011	Travel to attend international conference on Silicon in Agriculture	Nov 99–Jan 00	Mrs S Berthelsen	\$5,077
--------	---	---------------	------------------	---------

<b>Total — Program 2 (Continuing Projects)</b>			<b>25</b>	<b>\$1,434,441</b>
--	--	--	-----------	--------------------

<b>Total — Program 2 (New Projects)</b>			<b>3</b>	<b>\$187,831</b>
---	--	--	----------	------------------

<b>Total — Program 2</b>			<b>28</b>	<b>\$1,622,272</b>
--------------------------	--	--	-----------	--------------------

**Program 3 Crop Protection**

**Strategy 3.1 To develop effective IPM programs targeting high-priority pests, weeds and diseases, and to ensure that control measures applied throughout the industry are cost-effective**

**CONTINUING PROJECTS**

BSS134	A Metarhizium-based product for control of cane pests	Jan 95–Dec 99	Dr P Samson	\$109,589
--------	---	---------------	-------------	-----------

BSS160	Integrated pest management of soldier fly	Jul 96–Jun 00	Dr P Samson	\$52,500
--------	---	---------------	-------------	----------

BSS166	Effect of farming practices on canegrub incidence	Jul 96–Dec 00	Dr P Allsopp	\$68,000
--------	---	---------------	--------------	----------

BSS186	Development of a method to aid decision making on herbicide use for Australian canegrowers	Jul 97–Dec 00	Mr T Willcox	\$82,348
--------	--	---------------	--------------	----------

BSS201	Determining the biology of Rhopaea canegrubs in the NSW and Queensland sugar industries	Jul 98–Dec 01	Mr P McGuire	\$35,850
--------	---	---------------	--------------	----------

BSS203	Further characterization of pathogenicity genes from Clavibacter xyli subsp. xyli, causal organism of ratoon stunting disease	Jul 98–Jun 01	Dr S Brumbley	\$67,636
--------	---	---------------	---------------	----------

BSS205	Control of greyback canegrub by manipulating adult behaviour	Jul 98–Jun 00	Mr D Logan	\$71,704
--------	--	---------------	------------	----------



<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
BSS215	Taxonomy of the downy mildew pathogen <i>Peronosclerospora sacchari</i>	Feb 99–Jun 01	Dr R Magarey	\$7,500
CTA043	Provision of improved varieties and pathology services for the Ord Sugar Industry	Jul 98–Jun 02	Dr R Shorter	\$49,842
NTU001	Development of tests for the yellow leaf, white leaf and grassyshoot phytoplasmas and determination of their importance in Australian sugarcane	Jul 98–Jun 01	Dr K Gibb	\$74,871

#### **NEW PROJECTS**

BSS236	Management strategies for <i>Rhyparida</i> in southern Queensland	Jul 99–Dec 01	Dr P Allsopp	\$72,994
BSS239	Support for an ARC project to investigate genetic diversity of <i>Clavibacter xyli</i> subsp. <i>xyli</i> isolates	Jul 99–Jun 02	Dr S Brumbley	\$7,000
WAA002	Sugarcane smut variety screening in the Ord.	Jul 99–Jun 00	Dr J Sherrard	\$15,000

#### ***Strategy 3.2 To better prioritise R&D effort***

##### **CONTINUING PROJECTS**

BSS230	Survey of sugarcane in eastern Australia for sugarcane smut	Jan 99–Oct 00	Mr B Croft	\$64,620
SAI001	Preparation of a CD Rom library of plant-parasitic nematodes	Oct 98–May 03	Dr J Nobbs	\$10,007

#### ***Strategy 3.3 To understand and ameliorate the yield decline phenomenon***

##### **CONTINUING PROJECTS**

CLW004	Breakdown in soil productive capacity under sugarcane monoculture	Jul 95–Jun 01	Dr K Bristow	\$13,993
--------	---	---------------	--------------	----------

##### **NEW PROJECTS**

YDV002	Yield Decline Joint Venture Phase 2 (Part funding)	Jul 99–Jun 05	Dr A Garside	\$175,502
--------	--	---------------	--------------	-----------

Project	Title	Duration	Contact	Funds 1999/00
---------	-------	----------	---------	------------------

***Strategy 3.4 To develop methodologies for the safe exchange of germplasm***

**CONTINUING PROJECTS**

BSS187	Implementation of sensitive pathogen indexing methods in sugarcane quarantine	Jul 97–Jun 00	Dr P Whittle	\$68,015
UQ024	Development of DNA based diagnostic systems for sugarcane pathogens	Jul 96–Jun 00	Dr D Maclean	\$35,615

***Strategy 3.9 Travel***

**NEW PROJECTS**

AU001	Travel proposal to present results of Ph.D. project entitled “Sequencing of the sugarcane striate mosaic virus”	Aug 99–Sep 99	Ms N Thompson	\$1,329
-------	---	---------------	---------------	---------

<b>Total — Program 3 (Continuing Projects)</b>			<b>15</b>	<b>\$812,090</b>
<b>Total — Program 3 (New Projects)</b>			<b>5</b>	<b>\$271,825</b>
<b>Total — Program 3</b>			<b>20</b>	<b>\$1,083,915</b>

**Program 4 Cane Harvesting and Transport**

***Strategy 4.1 To reduce cane losses, stool damage and extraneous matter***

**CONTINUING PROJECTS**

BSS189	Facilitation of best practice to reduce extraneous matter and cane loss	Jul 97–Jun 00	Mr C Norris	\$55,044
BSS207	A program to minimise soil in the cane supply	Jul 98–Dec 01	Mr A Linedale	\$72,961
BSS210	Lightweight elevator and advanced secondary cleaning system for cane harvesters	Jul 98–Jun 00	Mr C Norris	\$65,922
NCA004	Improvements in basecutter design and cane feeding	Jul 97–Dec 00	Assoc Prof H Harris	\$47,700
SRI082	Base cutter height control and row guidance for cane harvesters	Jul 98–Jun 00	Mr M Schembri	\$39,741

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
----------------	--------------	-----------------	----------------	--------------------------

**NEW PROJECTS**

NCA007	Improved base cutter design to minimise dirt in cane supply	Jul 99–Jun 00	Assoc Prof H Harris	\$38,500
JCU019	Close-range, microwave radar for automatic control of base-cutter height and other cane harvester operations	Jul 99–Jul 02	Dr G Woods	\$44,455

***Strategy 4.2 To expand the application of green cane harvesting***

**CONTINUING PROJECTS**

BSS165	Improved feeding of green cane by harvesters	Jan 97–Jan 00	Mr C Norris	\$32,803
NCA005	Automatic guidance of harvesters	Jul 97–Jul 99	Prof M McKay	\$7,820

***Strategy 4.3 To improve the efficiency and reduce the cost of harvesting and transport***

**CONTINUING PROJECTS**

BSS190	Upgrading load and speed limits for cane transport vehicles	Jul 97–Jun 00	Mr C Norris	\$12,221
SRI080	To support the introduction of TOTools into traffic offices	Jul 98–Jun 00	Mr A Pinkney	\$18,803

***Strategy 4.9 Travel***

**NEW PROJECTS**

BSS240	Evaluation of alternative harvester technologies	Jul 99–Jun 00	Mr C Norris	\$14,200
--------	--	---------------	-------------	----------

<b>Total — Program 4 (Continuing Projects)</b>			<b>9</b>	<b>\$353,015</b>
--	--	--	----------	------------------

<b>Total — Program 4 (New Projects)</b>			<b>3</b>	<b>\$97,155</b>
---	--	--	----------	-----------------

<b>Total — Program 4</b>			<b>12</b>	<b>\$450,170</b>
--------------------------	--	--	-----------	------------------

**Program 5 Sugar Manufacture**

***Strategy 5.1 To improve the economics of sugar mill processing***

**CONTINUING PROJECTS**

JCU010	Mathematical modelling of circulation and crystallisation in vacuum pans	Jul 97–Jul 00	Dr J Harris	\$19,230
--------	--	---------------	-------------	----------

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
JCU011	Crushing of cane and bagasse: finite element model applications	Jul 97–Dec 00	Assoc Prof J Loughran	\$45,000
JCU015	Empirical modelling of the reabsorption phenomenon	Jul 98–Oct 99	Assoc Prof J Loughran	\$3,269
SRI069	Improved control and throughput of batch pans	Jul 97–Jul 99	Mr K Miller	\$9,800
SRI070	Sugar extraction mechanisms in milling trains II	Jul 97–Jul 99	Mr G Kent	\$3,300
SRI071	Experimental investigation of mill feeding	Jul 97–Jul 99	Mr G Kent	\$13,300
SRI072	Oxalic acid levels in first expressed juice through to syrup	Jul 97–Jul 99	Dr W Doherty	\$4,800
SRI079	Advanced spreader design for increased boiler capacity and firing low moisture predried bagasse	Jul 98–May 02	Dr T Dixon	\$80,531
SRI083	Storage of liquor and other pan stage materials for later processing	Jul 98–Jun 00	Dr R Broadfoot	\$48,100
SRI084	The application of NIR based on-line monitoring in the sugar manufacturing process	Jul 98–Jun 00	Dr L Edye	\$20,521
UQ027	Enhancing pan boiling by exploiting sugar crystal growth variability	Jul 97–Jul 99	Prof E White	\$2,000
US002	Syntheses of polymer additives for juice processing capacity and performance	Mar 98–Mar 01	Dr A Cheung	\$107,129

#### **NEW PROJECTS**

JCU020	Experimental and numerical investigation to improve the dewatering of prepared sugar cane and bagasse	Jul 99–Dec 02	Assoc Prof J Loughran	\$130,332
JCU021	An experimental study of boiling in calandria tubes	Jul 99–Jul 01	Dr J Harris	\$80,000
SRI095	Fundamental studies on the chemistry of clarification	Jul 99–Jun 03	Dr W Doherty	\$105,436
SRI096	Application of membrane filtration for pan stage capacity increase and improved sugar quality	Jul 99–Jun 01	Mr R Steindl	\$204,992

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
----------------	--------------	-----------------	----------------	--------------------------

***Strategy 5.2 To increase the revenue base from sugarcane processing***

**CONTINUING PROJECTS**

SRI055	Prevention of spontaneous combustion in bagasse stockpiles	Jul 95–Sep 99	Dr T Dixon	\$9,406
US001	Activation of the fibrous components of the sugar cane for removal of heavy metals from waste water	Jul 97–Jul 00	Dr M Valix	\$39,000

***Strategy 5.9 Travel***

**NEW PROJECTS**

JCU022	Travel to CFX conference and for multiphase flow discourse	Jul 99–Aug 99	Mr D Stephens	\$5,600
--------	--	---------------	---------------	---------

**Other Projects** \$70,152

**Total — Program 5 (Continuing Projects)** **14** **\$405,386**

**Total — Program 5 (New Projects)** **6** **\$596,512**

**Total — Program 5** **21** **\$1,001,898**

**Program 6 Environmental and Natural Resource Management**

***Strategy 6.1 To understand the mechanisms, paths and impacts of nutrient and chemical losses***

**CONTINUING PROJECTS**

BSS125	Pesticide residues in the Queensland sugar industry	Jul 94–Sep 00	Mr B Stickley	\$65,000
BSS191	Loss patterns of pesticides and nutrients in surface drainage water from irrigated individual canefields	Mar 98–Jun 01	Mr G Ham	\$67,997
CTA031	A stocktake of the levels and sources of nitrate in groundwaters associated with sugarcane areas	Jul 97–Dec 00	Dr K Weier	\$53,870
DNR001	Pesticide transport in sugar production systems	Jan 97–Dec 00	Mr P Hargreaves	\$40,380
DNR002	Environmental impact of nitrate retention at depth	Jul 97–Dec 00	Dr V Rasiah	\$82,000
JCU016	Quantification of effects of cane field drainage on stream ecology	Jul 98–Dec 01	Assoc Prof R Pearson	\$99,547

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
----------------	--------------	-----------------	----------------	--------------------------

**NEW PROJECTS**

NSC003	Improving the quality of drainage water from NSW canelands	Jul 99–Sep 02	Mr P Nielsen	\$82,350
--------	--	---------------	--------------	----------

***Strategy 6.2 To reduce the losses of nutrients and chemicals and sustain the land and water resource***

**CONTINUING PROJECTS**

BSS173	Quantifying the socio-economic impact of harvesting residue retention systems	Oct 96–Feb 02	Dr J Windle	\$87,098
BSS176	Optimisation of nutrient management in catchments of the Queensland Sugar Industry	Jul 96–Jun 00	Mr D Burgess	\$45,000
CLW007	Quantifying and managing sources of sediments and nutrients in low-lying canelands	Jul 98–Dec 01	Dr C Roth	\$85,995
DNR004	Prediction and management of acidity production and export from acid sulphate soils used for sugar production	Jul 97–Jun 01	Mr T Gardner	\$81,586
DNR005	Develop a water resource management strategy for the Mackay coastal aquifer system	Jul 96–Jul 00	Mr R Sorensen	\$0
JRA001	Towards long-term sustainability of sugarcane farming in the Johnstone River catchment	Jul 97–Jun 00	Mr B Stewart	\$65,635

**NEW PROJECTS**

BSS238	Raising awareness and adoption of sustainable cane growing practices	Jul 99–Jun 01	Ms I Christiansen	\$121,964
NA003	Hydrologic effects of flood gate management on coastal floodplain agriculture — the sugarcane component	Jul 99–Jun 04	Mr M Hughes	\$35,586

***Strategy 6.3 To reduce the environmental impact of sugar manufacturing operations by the development and adoption of sustainable practices and processes***

**CONTINUING PROJECTS**

SRI077	Microbiology of sugar mill cooling towers and spray ponds; potential for Legionella control	Jul 98–Dec 01	Dr M Dawson	\$67,428
--------	---	---------------	-------------	----------



Project	Title	Duration	Contact	Funds 1999/00
---------	-------	----------	---------	------------------

**Strategy 6.4 To establish effective links between R&D activity related to environmental and natural resource management conducted outside of this program**

**CONTINUING PROJECTS**

BSS202	Resource assessment for sustainable land development and management of new canegrowing areas	Jan 99–Dec 01	Mr R Beattie	\$76,960
CTA039	Improved integrated resource planning in the Australian sugar industry	Jul 98–Oct 01	Dr A Johnson	\$106,901

**Strategy 6.5 To improve the occupational health and safety environment of sugar industry personnel**

**NEW PROJECTS**

CG001	Code of practice and guidelines for mill locomotives and cane harvesting and haulout equipment operating in shared workplaces and on-farm	Jul 99–Jun 00	Mr G Trost	\$84,420
<b>Total — Program 6 (Continuing Projects)</b>			<b>15</b>	<b>\$1,025,397</b>
<b>Total — Program 6 (New Projects)</b>			<b>4</b>	<b>\$324,320</b>
<b>Total — Program 6</b>			<b>19</b>	<b>\$1,349,717</b>

**Program 7 Enhanced Marketability**

**Strategy 7.1 To develop improved systems for the efficient and integrated management of sugar quality (as defined by customers)**

**CONTINUING PROJECTS**

BSS164	Identification of primary phenotypic traits that determine polysaccharide gum potential	Jul 96–Dec 00	Dr M Cox	\$45,000
BSS192	Refinability of Australian raw sugars in terms of colour removal	Jul 97–Apr 00	Dr G Leonard	\$49,576
CTA034	Predicting the incidence and magnitude of polysaccharide impurities and identifying the causal field-factors	Jul 98–Aug 03	Dr G Bonnett	\$86,650

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
CTA042	Does reducing polyphenol oxidase activity in transgenic sugarcane lead to lower crystal colour?	Jul 98–Jun 01	Dr C Grof	\$125,533
JCU017	Development of a test for polysaccharide in raw sugar	Jan 99–Jun 01	Ms M Wood	\$100,230
SRI081	Light scattering technology to predict impurity formation in sugars	Jul 98–Jun 00	Dr W Doherty	\$67,763
<b>NEW PROJECTS</b>				
SRI097	Costs and benefits of the CBA boiling scheme for high pol sugar production	Jul 99–Jun 00	Dr R Broadfoot	\$34,660
UQ035	Molecular ecological studies on the formation of polysaccharide impurities in raw sugar	Jul 99–Jun 02	Dr L Sly	\$104,958
<b>Total — Program 7 (Continuing Projects)</b>			<b>6</b>	<b>\$474,752</b>
<b>Total — Program 7 (New Projects)</b>			<b>2</b>	<b>\$139,618</b>
<b>Total — Program 7</b>			<b>8</b>	<b>\$614,370</b>

## **Program 8 Industry Competitiveness**

### ***Strategy 8.1 To improve industry competitiveness***

#### **CONTINUING PROJECTS**

ARP001	Australian Rural Leadership Program	Jul 92–Jun 00	Mr M Beckingham	\$18,750
BSS193	Developing marketing skills for sugar industry technology transfer personnel	Jul 97–Jun 01	Mr G McMahon	\$81,497
BSS194	Reducing the risk of exotic pests and diseases in cane	Jul 97–Jul 99	Dr R Magarey	\$6,499
CTA036	Seasonal climate forecasting to improve industry competitiveness	Jul 98–Dec 02	Dr R Muchow	\$72,671
CTA037	International collaboration on systems approaches to profitable sugar production	Jul 98–Jun 02	Dr R Muchow	\$12,000
CVA001	Climate Variability in Agriculture Program	Jul 98–Jun 01	Dr B White	\$30,000
DPE001	Development of Australian Rural Research in Progress database	Jul 88–Jun 00	Ms P Handyside	\$4,026

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
MSA001	Cane supply options analysis for maximising whole industry profitability. A case study for Mackay	Jul 97–Jun 01	Mr J King	\$54,200
RPM001	The Rocky Point strategic study	Dec 97–Feb 00	Mr P Kaddatz	\$33,475
<b>NEW PROJECTS</b>				
BSS235	A pilot study to develop education with focus on sugar for women in the Herbert River district	Jul 99–Jun 02	Ms D Brown	\$9,320
<b>Total — Program 8 (Continuing Projects)</b>			<b>9</b>	<b>\$313,118</b>
<b>Total — Program 8 (New Projects)</b>			<b>1</b>	<b>\$9,320</b>
<b>Total — Program 8</b>			<b>10</b>	<b>\$322,438</b>

## **Program 9 Scholarships**

### **CONTINUING SCHOLARSHIPS**

STU020	D Harrison — Transgenes as tools for understanding the inheritance and expression of genes in sugarcane	Jan 97–May 00	Mr D Harrison	\$24,583
STU021	I Searle — Cloning of nodulation genes for genetic engineering of nodulation and nitrogen fixation in sugarcane	Feb 97–Feb 00	Mr I Searle	\$16,963
STU022	R Raicu-Baclagian — Integrated GPS/GIS for use in monitoring, modelling and managing cane harvest transport systems	Mar 98–Feb 01	Ms R Raicu-Baclagian	\$27,000
STU023	L Pickering — Transgene-mediated resistance to sugarcane mosaic virus	Feb 98–Feb 01	Ms L Pickering	\$27,000
STU024	G Singh — Overcoming constraints to high yield and CCS	Sep 97–Sep 00	Mr G Singh	\$21,000
STU025	R McQualter — Production and evaluation of Fiji disease virus resistant transgenic sugarcane plants	Feb 98–Feb 01	Mr R McQualter	\$27,000
STU026	B Salter — Varietal and environmental factors predisposing to suckering in the wet tropics	Aug 98–Jul 01	Mr B Salter	\$21,000

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
STU027	N. Bower — Functional genomics of sugarcane	Mar 99–Feb 02	Mr N Bower	\$27,000
STU028	S. McCarthy — Automatic control of topper height	Feb 99–Feb 02	Mr S McCarthy	\$27,000
STU029	M Poggio (Hons) — Phytotoxicity of herbicides in sugarcane	Mar 99–Dec 99	Mr M Poggio	\$0
STU030	N Vass (Hons) — Modelling of bagasse compaction between grooved surfaces	Mar 99–Dec 99	Ms N Vass	\$0
<b>NEW SCHOLARSHIPS</b>				
STU031	New JCU Postgraduate	Jul 99–Jun 02		\$21,000
STU032	New SRDC Postgraduate	Jan 00–Dec 02		\$14,500
STU033	New SRDC Postgraduate	Jan 00–Dec 02		\$14,500
STU034	New SRDC Honours	Feb 00–Dec 00		\$6,000
STU035	New SRDC Honours	Feb 00–Dec 00		\$6,000
	Augmentation and Travel Grants			\$13,000
<b>Total — Program 9 (Continuing Projects)</b>			<b>9</b>	<b>\$218,546</b>
<b>Total — Program 9 (New Projects)</b>			<b>5</b>	<b>\$75,000</b>
<b>Total — Program 9</b>			<b>14</b>	<b>\$293,546</b>

**ATTACHMENT C  
1999/00 RESEARCH AND DEVELOPMENT PORTFOLIO  
CP2002 BUDGET**

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
----------------	--------------	-----------------	----------------	--------------------------

**Program 1 Plant Improvement**

***Strategy 1.2 To increase the range and use of parents***

**CONTINUING PROJECTS**

BSS219	Production of progeny from high-CCS clones and their exploitation for G x E for high CCS and acceptable ideotype for the wet tropics	Jun 99–Jun 02	Dr N Berding	\$24,326
--------	--	---------------	--------------	----------

***Strategy 1.3 To improve and accelerate the selection and characterisation of new varieties***

**NEW PROJECTS**

NSC002	Construction of full-track weigh bin for trial harvest	Jul 99–Jun 00	Mr P Nielsen	\$45,000
--------	--	---------------	--------------	----------

***Strategy 1.4 To increase the rate and extent of uptake of new varieties***

**NEW PROJECTS**

BSS234	Best management practice for sugarcane varieties	Apr 99–Jun 02	Mr R Kelly	\$155,477
--------	--	---------------	------------	-----------

<b>Total – Continuing Projects</b>			<b>1</b>	<b>\$24,326</b>
------------------------------------	--	--	----------	-----------------

<b>Total – New Projects</b>			<b>2</b>	<b>\$200,477</b>
-----------------------------	--	--	----------	------------------

<b>Total – Program 1</b>			<b>3</b>	<b>\$224,803</b>
--------------------------	--	--	----------	------------------

**Program 2 Crop Management**

***Strategy 2.1 To develop sustainable crop management practices***

**CONTINUING PROJECTS**

BSS220	Understanding why potential field ccs is not realised at the factory	Jan 99–Dec 01	Mr A Hurney	\$189,593
--------	--	---------------	-------------	-----------

BSS221	Environmental stimuli for sugarcane suckering in the wet tropics	Jan 99–Dec 01	Mr A Hurney	\$106,023
--------	--	---------------	-------------	-----------

**NEW PROJECTS**

BSS232	Improved nutrient management in the Australian sugar industry	Jul 99–Sep 02	Mr B Schroeder	\$97,770
--------	---	---------------	----------------	----------

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
CLW009	Improving yield and ccs in sugarcane through the application of silicon based amendments	Jul 99–Dec 02	Dr A Noble	\$123,778
CTA045	Improving CCS in the wet tropics via block-specific monitoring of N in cane delivered to the mill	Jul 99–Jun 02	Dr B Keating	\$120,906

***Strategy 2.2 To improve plant establishment, fertiliser placement and trash handling abilities***

**CONTINUING PROJECTS**

BSS216	Identifying factors that limit cane farm productivity and profitability in the Innisfail district	Oct 98–Nov 99	Mr P Lawrence	\$9,026
BSS222	Benchmarking and improving the financial performance of the sugar industry particularly in the northern districts	Jan 99–Jun 02	Mr G McMahon	\$81,000
UQ034	Analysis of sugarcane productivity trends in the wet tropics at a district level	Jan 99–Dec 00	Dr K Basford	\$54,375

***Strategy 2.3 To reduce production costs per tonne of sugar per hectare per year***

**NEW PROJECTS**

BCB001	Overcoming on-farm constraints to productivity and profitability in a wet tropical area	Apr 99–Jun 02	Mr M Goodson	\$51,972
--------	---	---------------	--------------	----------

***Strategy 2.4 To introduce sustainable production systems compatible with environmental and natural resource management***

**NEW PROJECTS**

YDV002	Sugar Yield Decline Joint Venture Phase 2 (Part funding)	Jul 99–Jun 05	Dr A Garside	\$104,309
<b>Total – Continuing Projects</b>			<b>5</b>	<b>\$440,017</b>
<b>Total – New Projects</b>			<b>5</b>	<b>\$498,735</b>
<b>Total – Program 2</b>			<b>10</b>	<b>\$938,752</b>

Project	Title	Duration	Contact	Funds 1999/00
---------	-------	----------	---------	------------------

**Program 3 Crop Protection**

**Strategy 3.1 To develop effective IPM programs targeting high-priority pests, weeds and diseases, and to ensure that control measures applied throughout the industry are cost-effective**

**CONTINUING PROJECTS**

BSS223	Management of greyback canegrub in sugarcane: from research to practice	Jan 99–Jul 03	Mr R Cocco	\$49,349
BSS224	Implementation of management strategies to address sugarcane weevil borer in far north Queensland	Jan 99–Dec 02	Mrs D Telford	\$67,086
BSS225	Enhanced adoption of integrated pest management in sugarcane	Jan 99–Dec 01	Dr P Samson	\$137,467
BSS226	Farming systems that optimise the control of greyback canegrubs by BioCane	Jan 99–Jun 02	Mr D Logan	\$38,296
CE003	Control of greyback canegrubs with a microsporidian pathogen	Nov 98–Jun 02	Dr D Dall	\$101,306

**Strategy 3.3 To understand and ameliorate the yield decline phenomenon**

**NEW PROJECTS**

YDV002	Sugar Yield Decline Joint Venture Phase 2 (Part funding)	Jul 99–Jun 05	Dr A Garside	\$104,309
--------	--	---------------	--------------	-----------

<b>Total – Continuing Projects</b>			<b>5</b>	<b>\$393,504</b>
<b>Total – New Projects</b>			<b>1</b>	<b>\$104,309</b>
<b>Total – Program 3</b>			<b>6</b>	<b>\$497,813</b>

**Program 4 Cane Harvesting and Transport**

**Strategy 4.1 To reduce cane losses, stool damage and extraneous matter**

**CONTINUING PROJECTS**

NCA006	Developing and improving the JetClean harvester cleaning system	Jan 99–Dec 01	Assoc Prof H Harris	\$78,226
--------	---	---------------	---------------------	----------



Project	Title	Duration	Contact	Funds 1999/00
---------	-------	----------	---------	------------------

**Strategy 4.2 To expand the application of green cane harvesting**

**NEW PROJECTS**

SRI092	Commercial implementation of the crop divider height control system	Jul 99–Jun 00	Mr M Schembri	\$91,738
--------	---	---------------	---------------	----------

**Strategy 4.3 To improve the efficiency and reduce the cost of harvesting and transport**

**CONTINUING PROJECTS**

BSS227	A participatory approach towards improving industry sector profits through improved harvest efficiency	Jan 99–Jun 02	Mr T Willcox	\$131,043
--------	--	---------------	--------------	-----------

**NEW PROJECTS**

SRI090	An extended model of the economic impact of EM components on the sugar industry	Jul 99–Dec 00	Dr P Hobson	\$84,017
--------	---	---------------	-------------	----------

<b>Total – Continuing Projects</b>			<b>2</b>	<b>\$209,269</b>
<b>Total – New Projects</b>			<b>2</b>	<b>\$175,755</b>
<b>Total – Program 4</b>			<b>4</b>	<b>\$385,024</b>

**Program 5 Sugar Manufacture**

**Strategy 5.1 To improve the economics of sugar mill processing**

**CONTINUING PROJECTS**

CSU001	An on-line cane monitoring system to measure the extraneous matter present in billet sugar cane	Mar 98–Dec 00	Dr W Moore	\$20,000
JCU018	Improved batch pan monitoring, control and optimisation — a soft sensor approach	Mar 99–Jun 01	Dr P Schneider	\$37,329
SRI088	Increasing milling unit capacity by improving mill feeding performance	Feb 99–Jun 02	Mr G Kent	\$52,309
SRI089	Improve the hindered settling, thickening and withdrawal of mud in the SRI clarifier	Feb 99–Jun 01	Mr R Steindl	\$23,006

<b>Project</b>	<b>Title</b>	<b>Duration</b>	<b>Contact</b>	<b>Funds 1999/00</b>
<b>NEW PROJECTS</b>				
SRI091	Advanced secondary air system for increased furnace firing capacity and boiler steam capacity	Jul 99–Dec 01	Dr T Dixon	\$134,085
SRI093	Improve the purging and washing efficiency of continuous high grade fugals	Jul 99–Jun 01	Dr R Broadfoot	\$52,203
<b>Total – Continuing Projects</b>			<b>4</b>	<b>\$132,644</b>
<b>Total – New Projects</b>			<b>2</b>	<b>\$186,288</b>
<b>Total – Program 5</b>			<b>6</b>	<b>\$318,932</b>

**Program 8 Industry Competitiveness**  
***Strategy 8.1 To improve industry competitiveness***

**CONTINUING PROJECTS**

CTA044	Delivering the capability to evaluate alternative cane supply arrangements across the sugar industry using a whole industry systems approach	May 99–Jun 02	Dr R Muchow	\$126,307
MA001	Better management practice in the Australian sugar industry: CP2002	Jan 99–Jun 02	Mr E Colquhoun	\$115,840

**NEW PROJECTS**

BSS233	Improving technical communication within the sugar industry: development of a best practice resource package for greyback canegrub	Jul 99–Jun 00	Ms J Marsh	\$50,927
<b>Total – Continuing Projects</b>			<b>2</b>	<b>\$242,147</b>
<b>Total – New Projects</b>			<b>1</b>	<b>\$50,927</b>
<b>Total – Program 8</b>			<b>3</b>	<b>\$293,074</b>

<b>Project Codes</b>	<b>Organisation</b>
AR	Agridry Rimik Pty Ltd
ARP	Australian Rural Leadership Program
AU	Adelaide University
BCB	Babinda Cane Protection & Productivity Board
BSS	Bureau of Sugar Experiment Stations
CE	CSIRO Entomology
CG	CANEGROWERS
CLW	CSIRO Land and Water
CSR	CSR Ltd
CSU	Charles Sturt University
CTA	CSIRO Tropical Agriculture
CVA	Climate Variability in Agriculture Program
DNR	Queensland Department of Natural Resources
DPE	Department of Agriculture, Fisheries and Forestry
DPI	Queensland Department of Primary Industries
ICB	International Consortium of Sugarcane Biotechnology
JCU	James Cook University
JRA	Johnstone River Catchment Management Association
MA	Macarthur Agribusiness
MSA	Mackay Sugar Co-operative Association Ltd
NA	New South Wales Agriculture
NCA	National Centre for Engineering in Agriculture
NSC	New South Wales Sugar Milling Cooperative Ltd.
NTU	Northern Territory University
QUT	Queensland University of Technology
RPM	Rocky Point Sugar Industry Taskforce
SAI	South Australian Research and Development Institute
SCU	Southern Cross University
SRI	Sugar Research Institute
STU	Student Scholarships — SRDC
UNW	University of New South Wales
UQ	The University of Queensland
US	The University of Sydney
WAA	Western Australian Department of Agriculture
YDV	Yield Decline Joint Venture