

# RESEARCH AND DEVELOPMENT FOR THE AUSTRALIAN SUGAR INDUSTRY: DEVELOPMENTS SINCE 1995

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## Abstract

Since 1995 (the last time the author addressed the SASTA Congress), the Australian sugar industry has been through significant change. This paper discusses some of those changes and provides a perspective on the responses to those changes.

The industry has been through both good and bad times in this period. Production, price and profitability have been through the familiar cycle of highs and lows. The industry has recognised that the key driver for continued prosperity is the capacity to deliver a reliable and increasing cane supply and reducing input costs. R&D has a significant role to play in achieving this goal.

The R&D environment has also experienced significant change. BSES and CPPBs have both had compulsory levies replaced by voluntary fees. BSES is moving toward becoming an industry-owned entity rather than a Statutory Authority. During this period, enhanced collaboration has been established within Australia and internationally.

The impact of R&D has continued to be evaluated by both economic analysis and analysis of benefit from delivery to industry. R&D investment does offer considerable economic benefits and is a worthwhile investment in both economically favourable and unfavourable times, and should not simply be regarded as a cost affecting the bottom line.

*Keywords:* research and development, Australia, change, investment structure, impact

## Introduction

Since I addressed the SASTA Congress in 1995 (Wallis, 1995) significant changes have occurred in the sugar industry in Australia, in the Research and Development (R&D) environment and in the understanding of the impact of R&D on industry performance.

This paper is designed to outline these changes and discuss their implications for the Australian sugar industry and identify any lessons that might be applicable to other industries.

The period since 1995 saw increasing production initially but this was followed by a series of difficult climatic years (either too dry or too wet) when production and productivity fell. This fall was accentuated by the widespread infection of orange rust on a major variety, Q124. Also during this period, smut was identified in the Western Australian industry. This disease has not yet spread to the east coast but the incursion into Australia has had a major impact on the R&D objectives of the Queensland Industry.

The Industry has clearly recognized that a reliable and increasing cane supply is the driving force for industry prosperity.

The R&D environment has also changed significantly. Both the Bureau of Sugar Experiment Stations (BSES) and the Cane Protection and Productivity Boards (CPPBs) have lost their compulsory levies and moved to a voluntary service fee basis. In the case of BSES, 98% of growers and all millers continue to pay the voluntary service fee. If this situation is to continue, then BSES must be able to demonstrate that its R&D adds value to the stakeholders' business through improved profitability.

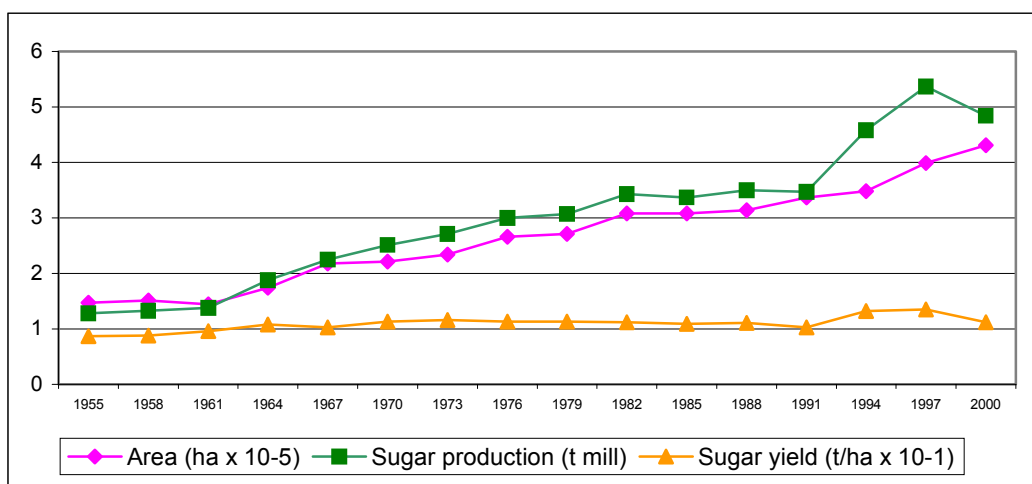
The Sugar Research and Development Corporation (SRDC), BSES and the Sugar Research Institute (SRI) have conducted further Benefit Cost Analyses (BCAs). These analyses are useful benchmarks to evaluate the impact of investment in R&D.

### Significant changes since 1995

#### Industry environment

##### *Production/productivity trends*

As indicated by Wallis (1995), production has increased dramatically since the 1900s. Updated data on area, production and sugar yield are presented in Figure 1<sup>1</sup>.



**Figure 1. Trends in Australian sugar production 1953-2000.**

The trends in production (by region) are presented in Table 1.<sup>2</sup>

Significant fluctuations in the world price for sugar have severely tested the competitive position of the Australian sugar industry. It is now clear that whilst the technical efficiency of the industry remains high, cost efficiency has not maintained its previous leadership among competitors.

This situation has led to self-assessment of the industry's position, the drivers that will maintain competitive advantage and an evaluation of potential mechanisms to improve international competitiveness.

<sup>1</sup> Source: Dr VE Mungomery, SRDC (personal communication)

<sup>2</sup> Source: Annual Review, Australian Sugar Milling Council (2002); R Beattie (personal communication) NSW data; RC Muchow (personal communication) Western Australian data

**Table 1. Cane Production in Australia 1994-2001.**

Region	Cane cut (t x 10 <sup>-3</sup> )						
	1994	1996	1997	1998	1999	2000	2001
<b>Queensland</b>							
Northern	6,471	7,392	7,227	7,697	7,050	5,950	6,241
Herbert/Burdekin	10,621	12,797	13,607	12,096	12,628	10,286	10,455
Mackay/Proserpine	9,972	11,155	11,076	11,398	10,348	7,176	7,623
South	5,782	5,285	6,218	5,976	6,919	5,367	5,525
<b>New South Wales</b>	2,096	2,387	2,537	2,534	2,544	1,977	2,090
<b>Western Australia</b>	-	387	411	477	474	461	291
<b>Total</b>	34,942	39,403	41,076	40,178	39,963	31,217	32,225

The general conclusion drawn is that reliable and increasing cane productivity is the key driver for prosperity in the industry. BSES has responded by announcing a new initiative, PROSPER, to assist industry in achieving this goal. Several major milling companies have also established initiatives in collaboration with growers, harvesters and R&D providers to achieve the same goals.

These initiatives may well change the structures, price signals and way in which the Australian Industry maintains competitiveness.

#### *Influence of pests and diseases*

Since 1995, the impacts of previously unimportant or new diseases (in the Australian context) have had significant impact on industry performance.

The first of these was the identification of smut for the first time in Australia in the Western Australian Industry in 1998. This discovery had a significant impact in Western Australia with yield losses being a major issue. The impact has been dramatically reduced with the replacement of susceptible varieties by resistant varieties. Constant vigilance will need to be maintained to ensure the impact of the disease remains under control. The current situation is that the industry in Western Australia (a small one of approximately 500,000 tons) is reliant on very few varieties, and this is an undesirable situation.

The impact of smut on the east coast industry is indirect. R&D priorities have been modified to enhance the emphasis on smut resistance in varieties released in order to combat the potential incursion of the disease. Offshore screening (in Java, Indonesia) is being conducted to test improved germplasm prior to release. Good progress has been made in this program.

The second disease impact was much more significant on the industry as a whole. The previously unimportant disease, orange rust (*Puccinia kuehnii*) reached epiphytotic proportions on the major variety Q124 in 2000 (Magarey *et al.*, 2001). The disease was first observed in the Central region but has spread to other regions growing Q124. At the time of identification of the disease, Q124 provided 80% of the Queensland cane supply.

The immediate R&D response was to evaluate, register and apply appropriate fungicide treatments. Success was variable but generally effective, but was expensive.

Resistant varieties have now been identified and major replacement programs for Q124 established. Currently, Q124 provides approximately 20% of the Queensland cane supply.

The rise in importance of orange rust could not be foreseen and was probably a result of a change in the genotype of the rust organism together with favourable environmental conditions.

R&D response was well coordinated and provided both short and long-term solutions to the problem. However, significant industry losses occurred during this period and the impact on both the profitability of the Industry and the associated communities was significant. The economic losses caused by orange rust in 2000 were estimated at \$A400m. In the Mackay region one mill area recorded a reduction from a five-year average of 101 t/ha and 13.45 ccs to 57.2 t/ha and 12.6 ccs (Magarey *et al.*, 2001). Some of this reduction could have been caused by climatic influences but it is considered that the most significant cause was orange rust.

More recently yield loss experiments recorded 40% yield loss in sprayed and unsprayed crops of Q124 (Magarey *et al.*, 2002).

Since 1995, the impact of canegrubs, particularly greyback canegrub (*Dermolepida albohirtum*) has increased from Mackay north.

R&D has provided an Integrated Pest Management program that has partially controlled the problem. No single chemical control has been identified and it is unlikely that such a control will be developed. The integrated controls established (Hunt *et al.*, 2002) have been delivered to industry and reasonably widely adopted. The 2002 season will provide information on the impact of this program.

#### *R&D initiatives to improve profitability*

During the period from 1995, three initiatives have been implemented to address the issues of declining profitability.

The first was an SRDC managed, Commonwealth funded initiative called CP 2002. This initiative used an additional A\$13.45m provided by Government to address the issues of declining sugar content and pest losses with an emphasis on north Queensland.

This program provided a significant boost to funding R&D of a more applied nature in the areas of best management practices for pests, water use, varieties and harvesting. The program has been reviewed (Woods *et al.*, 2001) and the conclusion drawn that it contributed significantly to resolution of the issues addressed.

The second is the PROSPER initiative of BSES, designed to capitalise on the benefits identified in CP 2002 and enhance the adoption of best management practices throughout the Industry. As indicated above, the overall objective is to achieve an increasing and reliable cane supply to return the industry to prosperity.

The third initiative, led by CSR Ltd, analysed the productivity/profitability issues in the CSR mill areas and this also concluded that cane supply is the most significant issue for determining profitability. A coordinated program involving all industry sectors is being implemented for 2002 to improve performance.

#### **R&D environment**

Several changes have occurred since 1995 to the environment in which R&D is delivered to industry. The major changes were:

### *Industry investment in R&D*

Investment in R&D has risen from A\$31.7m (Wallis, 1995) to A\$51m (SRDC, 2002). Industry contribution (A\$14.6m in 1995) has risen to A\$16.4m in 2001, which is approximately 32% of the total investment. The non-industry investment (Government, CSIRO, Universities) has increased significantly as industry funds were more effectively leveraged to achieve investment aimed at increasing the profitability of the sugar industry.

### *Loss of statutory levy for BSES and CPPBs*

The statutory based levies for BSES and CPPBs were withdrawn and replaced by voluntary service fees. In the case of BSES, 98% of growers and 100% of millers continue to provide funds for R&D to BSES. Industry contribution will only continue if tangible benefits continue to be delivered by BSES.

### *Corporatisation of BSES*

The Queensland Government announced in May 2001 that options for BSES to change from a Statutory Authority to an industry-owned entity were to be evaluated. An evaluation is currently being undertaken and is likely to lead to a structure for BSES outside of Government by the end of 2002.

This change is welcomed by BSES and will provide the industry with ownership of the assets they have paid for as well as provide BSES with a more commercial structure and focus.

### *Collaborative R&D delivery*

BSES has moved to establish collaborative linkages (strategic alliances) with a range of research providers.

Linkages have been established or will be strengthened with CSIRO - Plant Industry (plant improvement, including plant breeding and biotechnology) and the South African Sugar Experiment Station (SASEX) (in a range of areas to commence in 2003). Earlier collaborative linkages with SASEX are reported elsewhere in these proceedings.

The aim of these linkages is to achieve synergy through collaborative effort and gain more from the same input. This is an important step and one that has great potential to deliver benefits.

### *Regional Planning Advisory Committees*

BSES has established Regional Planning Advisory Committees (RPACs) in five regions in Queensland. Each RPAC is chaired by a BSES Director, with membership from BSES, sugar millers, growers and/or harvester operators.

These Committees have developed Regional R&D Workplans with priority allocated to the issues identified. These Workplans will be consolidated into a Queensland-wide R&D Plan and both the regional and statewide plans will guide BSES investment decisions.

This initiative is aimed at gaining enhanced industry input into BSES activities. Experience to date is very positive and the RPACs will provide a significant impact on the R&D environment of the Queensland Industry.

### *Sugar Research Institute*

The Sugar Research Institute (SRI) has also been faced with significant change. The voluntary levy was capped at A\$1.16m and has been declining in real terms over the period since 1995. Increased emphasis was given to collaborative projects driven by industry priorities. These syndicated projects have focussed SRI on industry outcomes that are shorter in delivery time. Active

management strategies have maintained investment in more strategic R&D through closer linkages with other providers, particularly several universities and commercial interests.

The overall reduction in industry support for SRI has led to expanded emphasis on commercialising R&D outcomes internationally.

SRI has brokered several significant projects with state and federal funding to investigate opportunities in renewal energy within the sugar industry.

#### *CRC for sustainable sugar production*

The CRC was established in 1995 and has provided a coordinating role to deliver five programs:

1. Protecting the environment
2. Sustaining soil and water resources
3. Enhancing productivity
4. Systems analysis and modelling
5. Education and training.

The CRC has attracted over A\$17m of federal government support during its tenure. It will complete its term on 30 June 2003.

The CRC is an unincorporated joint venture of 13 parties that represent the growing and milling sectors of the sugar industry, public research funding support, research organisations and universities (Anon., 2001).

Progress made by the CRC was excellent and a wide range of publications has resulted. The CRC was able to address issues that were sometimes considered 'too hard' by acting as an honest broker.

### **Impact of R&D**

#### *Benefit cost analyses*

Since 1995, SRDC, BSES and SRI have commissioned a further study of the impact of R&D. Wallis (1995) reported the Benefit Cost Analyses of an earlier study. The more recent study indicated that investment of resources in R&D is providing significant benefits to the sugar industry.

In this study, 41 projects funded over the five-year period to 1997/98 were randomly selected for qualitative evaluation. The main benefits delivered were improved knowledge and direct economic benefits.

Fourteen of the 41 projects were quantitatively assessed using benefit cost analysis techniques. The aggregate results for the 14 projects using a 5% discount rate were a Net Present Value (NPV) of A\$134m and a B-C ratio of 15:1. This indicates a high rate of return for the fourteen projects quantitatively assessed.

The benefits of the 14 projects were also compared with the costs of the 41 projects to provide an indication of the return on investment for a sample of projects funded in the past five years by BSES, SRDC and SRI. At a 5% discount rate, the NPV was estimated to be A\$116m and the B-C ratio was 5:1.

When these data are compared with results reported by Wallis (1995), it can be seen that the B/C ratio achieved overall was lower in the current study. The reasons are not clear but would include the wide range of projects sampled in the current study.

Both studies have indicated that significant benefits accrue from the investment in R&D, and the studies have been useful in discussions with funding bodies and government regarding the value of investment in R&D. It is proposed that a further study in this series be conducted in 2002.

#### *Review of SRDC's portfolio performance and prospects*

SRDC has been established for ten years and has invested A\$108m in R&D since its inception. Muchow and Wallis (2002) have reviewed the performance of SRDC over that period. The key industry outcomes delivered from the investment are described.

Muchow and Wallis (2002) conclude that SRDC has contributed to R&D performance by significantly increasing funds available for R&D; increasing the involvement of new R&D providers and enhancing collaboration; increasing accountability for R&D expenditure; enhancing the focus on outcomes; increasing the investment in strategic R&D; and fostering greater industry involvement throughout the R&D process.

### **Conclusions**

Since 1995, the Australian sugar industry has changed significantly. This has altered the R&D environment in which BSES and other service providers operate.

Investment in R&D has increased, mainly through attracting additional external funds. The previous compulsory levy funding of BSES and CPPBs has been removed and replaced by voluntary contributions. BSES is also moving towards becoming an industry owned entity rather than a Statutory Authority of the State of Queensland. Significant disease and pest occurrences have reduced industry profitability and R&D solutions have had to be identified.

The sugar industry has recognised that a reliable and increasing cane supply is fundamental to achieving prosperity. Input costs need to be reduced and R&D is one avenue to achieve this goal.

Further analyses of the investment performance of R&D have been conducted. These continue to indicate that the benefits exceed the costs by a considerable margin.

R&D is an important component in the future of the Australian sugar industry. It is important to continue to see input into R&D as an investment rather than a cost.

### **Acknowledgement**

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