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Bureau of Rural Sciences



TOWARDS A **SUSTAINABLE** SUGAR SUPPLY CHAIN

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TOWARDS A SUSTAINABLE SUGAR SUPPLY CHAIN

SCOPE OF THE REPORT

The Sugar Link project was established in 2004 to help develop a shared vision for a sustainable sugar supply chain. The project focused specifically on the NSW sugar industry (including key supply chain partners) and their vision/strategies for moving towards a sustainable sugar supply chain. It is important to note that the project did not attempt to assess the sustainability of the industry. This report outlines a number of important elements that need to be considered in any future attempts to evaluate the success of initiatives towards a sustainable sugar supply chain. It has a stronger focus on the production end of the sugar supply chain than the manufacturing and retail sectors, which require further investigation. There is also a greater focus on environmental issues as opposed to social aspects.

In the sugar industry, management of the supply chain is changing considerably in response to the often-difficult market environment. Market forces present real challenges to wholesalers and retailers but are exceptionally problematic for primary producers who often lack the knowledge to manage these new and dynamic relationships.

Food manufacturers and retailers increasingly demand consistent quality and on-time products from their suppliers. In recent years, considerable emphasis has been placed on rationalising the economic value chain to reduce excess costs and increase efficiency. Manufacturers and retailers have responded to the marketing

opportunity with product-label claims such as ‘animal friendly’ and ‘organic’. However, the credibility of these products depends on the ethical values of the chain partners and the verification of the claims through the entire supply chain. For many companies, which in the past have had an exclusive focus on providing economic value for shareholders, these consumer demands are driving new business strategies and changing relationships among chain partners.

To demonstrate the opportunities and challenges in achieving improved economic, social and environmental outcomes, three of NSW Sugar Milling Co-operative’s supply-chain collaborations are illustrated by tracking the progress of different sugar-industry products:

- » packaged Home Brand sugar supplied to Woolworths
- » bulk sugar sales to Nestlé
- » biofuel energy production in partnership with Delta Electricity.

This report is based on the research and contributions of the Sugar Link stakeholders.



Scope of the report	2
About Sugar Link	4
Being a responsible business	6
Sustainability reporting	7
Investing in the sugar supply chain	8
Consumer demand for sustainable products	10

The sugar industry	13
NSW sugar	17
Cultivating sugarcane	20
Milling sugar	29
Sugar-mill cogeneration with Delta Electricity	37
Sugar-consumption trends	43
Bulk sugar for Nestlé	44
Packaged sugar for Woolworths	46
Market diversification and collaboration	51
Where to next?	58

ABOUT SUGAR LINK

The Sugar Link project was funded by the Australian Government's Sustainable Industries Initiative, operated through the National Landcare Programme, and the NSW sugar industry. Sugar Link built on an environmental audit of the sugar industry¹ commissioned by the Industry Guidance Group appointed under the Sugar Industry Reform Programme (SIRP) 2002.

Over an 18-month period, Sugar Link collaborators attended three workshops that explored the sugar supply chain (Figure 1). This report reflects the discussion and learning that occurred during these workshops. The Sugar Link project aims to build an understanding of collaborative initiatives towards a sustainable sugar supply chain which includes consumers, communities and the environment as stakeholders. The boundaries of the Sugar Link sugar supply chain extend from sugar cultivation to the supermarket shelf. Collaborators in Sugar Link were primarily identified by the New South Wales Sugar Milling Co-operative. Nestlé and Woolworths were chosen because they are significant trading partners.

Roles of collaborators in Sugar Link

NSW growers: manage over 34,000 ha of coastal land in northern NSW for sugar production

NSW Sugar Milling Co-operative (NSWSMC): owned by NSW growers, mills sugar at three mills

Manildra Harwood Sugar (MHS), partnership between NSWSMC and the Manildra Group for sugar refining and marketing of sugar products.

Delta Electricity: has formed a partnership with NSWSMC to produce electricity using sugar plant leaf and waste material as fuel

Woolworths Limited: retailer, purchases Home Brand packaged sugar from MHS

Nestlé Australia Limited: manufacturer, purchases various types of bulk sugar from MHS

WWF: environmental group with a programme supporting sustainable agriculture

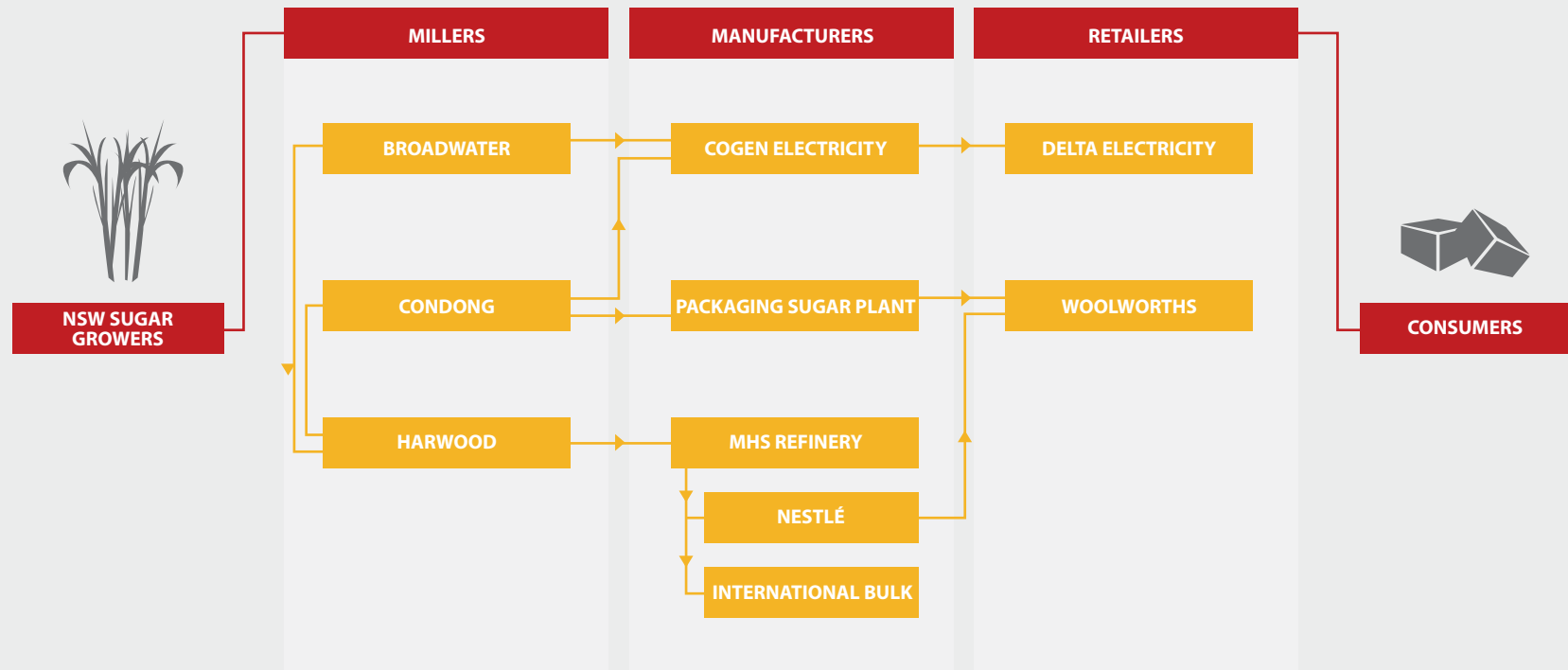
NSW Department of Environment and Conservation: state government department, is responsible for environmental regulation and education

Australian Government Department of Agriculture, Fisheries and Forestry: develops national policies on agriculture and food, including supporting research and development.

¹ C4ES (2004). *Independent Environmental Audit of the Sugar Industry in Queensland, New South Wales and Western Australia*, commissioned by the Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.



FIGURE 1 NSW SUGAR GROWERS

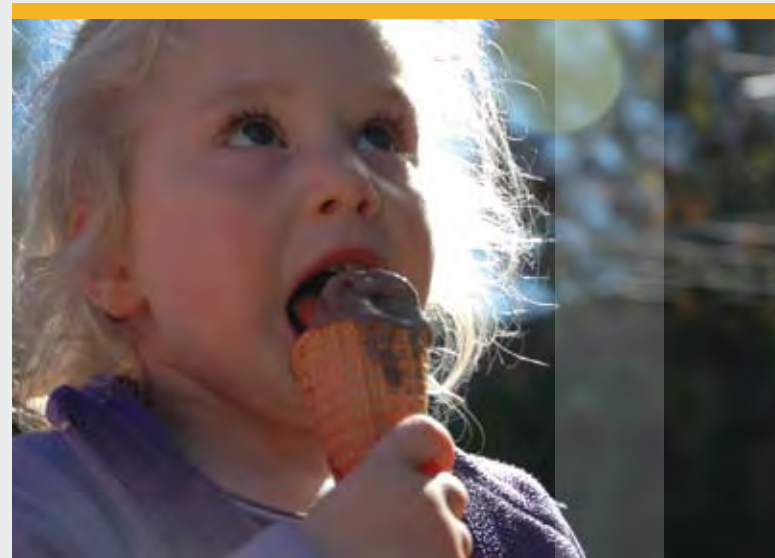


BEING A RESPONSIBLE BUSINESS

Corporate social responsibility is often defined as a company's obligation to be accountable to all of its stakeholders in all its operations and activities, with the aim of achieving sustainable development in the economic, social and environmental dimensions. However, grasping the fundamental nature of sustainability in an industry sector and its impacts on business is challenging, so there is a range of views about the way forward. Some believe that it is more about image and reputation, others are focused on indicators and measurement, but a growing number understand that sustainability is about strategy. That is, aligning leadership, ethical procurement in the supply chain, community partnerships and environmental performance with the financial business model. Increasingly, industry and companies are seeing sustainability as a framework to manage emerging issues, for creating product opportunities and to demonstrate to employees, shareholders, customers and the community their credentials as responsible operators.

In terms of leadership, sustainability means creating a culture — a system of values and norms of behaviour that espouse the importance of a sustainable approach to all aspects of business. The Sugar Link project has focused on exploring sustainability initiatives with the NSW Sugar Milling Co-operative supply-chain partners. Successful collaboration in the supply chain can enable market diversification and sustainable development by:

- » showing leadership in the supply chain by applying sustainable-development principles within own operations
- » debating with chain partners about what the future will look like
- » working collectively and encouraging stakeholders to contribute to decision making
- » measuring success using criteria other than financial
- » building human, ecological, social capital as well as financial
- » communicating success and challenges internally and externally
- » increasing transparency and enabling verification of products through the entire supply chain.





SUSTAINABILITY REPORTING

The purpose of a sustainability report, according to the Global Reporting Initiative (GRI)², is to provide a balanced and reasonable representation of the sustainability performance of the reporting organisation. The GRI Reporting Framework serves as a framework for reporting on an organisation's economic, environmental, and social performance. According to the United Nations Environment Programme (UNEP)³, the focus of the sustainability reports in the food and beverages cluster currently relates to single-entity companies:

One driver has been the way in which health, environmental and social issues increasingly cross-cut the cluster's incredibly complex supply chains. Challenges like animal welfare, intensive farming, mad-cow disease, genetically modified foods, ethical trade and the organics movement have encouraged growing uptake of corporate social reporting (CSR) and sustainable development (SD) thinking. That said, even the most advanced food producers, shippers and retailers are still at an embryonic stage in their reporting, let alone developing and deploying truly sustainable business models.

A sustainable supply chain, for the purposes of this publication, is defined as a supply chain that explicitly considers the social and environmental as well as the financial benefits and costs of its operation. The Sugar Link project aimed to build a shared vision and strategy about what is needed to move towards a sustainable sugar supply chain. More detailed future research is needed to monitor and evaluate the progress of the industry towards this goal. This report is based on the GRI framework and describes the New South Wales Sugar Milling Co-operative's (NSWSMC's)

initiatives to incorporate social and environmental, as well as financial, elements into their supply-chain strategy.

The purpose of defining and measuring these elements using indicators — a process known as 'benchmarking' — is to (a) provide reliable data for certification and verification and (b) to inform the stakeholders about progress towards targets. Benchmarking is an important principal of sustainability. The Signposts for Australian Agriculture framework⁴ currently under development aims to define Australian agricultural industry's contribution to environmentally sustainable development. It may also provide an opportunity for industry to aggregate and report good management at an industry scale. At the farm scale, government and industry have been working together to develop a system that enables the

- » identification of natural resource management priorities;
- » activities to address these priorities; and
- » programmes to build the capacity to measure, monitor and report on the outcomes of actions towards these priorities.

Many industry groups, including NSW Sugar, have been successful in aligning their industry management practices with regional natural resource management targets. Aligning priorities and measuring their progress towards these targets, is important for the verification of sustainable practices.

² GRI (Global Reporting Initiative) (2006). *Sustainability Reporting Guidelines (Draft)*, GRI, Amsterdam. <http://www.grig3.org/pdf/g3guidelines.pdf> (Accessed 24 June 2006).

³ SustainAbility and UNEP (United Nations Environment Programme) (2002). *Trust Us. The Global Reporters 2002 Survey of Corporate Sustainability Reporting*, SustainAbility Ltd and UNEP, London.

⁴ NLWRA (National Land & Water Resources Audit) (2006). *Signposts for Australian Agriculture*, NLWRA, Canberra. <http://www.nlwra.gov.au/projects.asp?section=67> (Accessed 25 June 2006).

INVESTING IN THE SUGAR SUPPLY CHAIN

Increasing uncertainty in export commodity prices and a concurrent narrowing of margins in its terms of trade has challenged the sugar industry in recent years. In 2002, the sugar industry and the Australian Government engaged in the SIRP 2002 to foster a business like and regional approach to industry activities.

Supply-chain management typically involves improving efficiency and reducing costs by ensuring that all stages of an operation (such as processing or transportation) are engaged at as close to full capacity as possible, with minimum unnecessary costs or risks. Leaders in the sugar industry are expanding their ideas of a supply chain to encompass collaborative efforts to diversify production and manage natural resources for the benefit of all parties. They recognise that stakeholders in the sugar industry need community, consumer and shareholder confidence in their products and management practices.

Future directions in Australian Government policies and programmes affecting the agricultural and food sector were identified by the Agriculture and Food Policy Reference Group. The group identified several major issues that require attention if the agricultural and food sector is to maintain its success into the future. A key message was 'that Australian farmers and food businesses should be optimistic about the future — but should also prepare for some serious challenges'.⁵ These challenges include such things as innovation, competition,

entrepreneurial skills' development, industry-based research, and more-effective cooperation between industry partners.

Two recent reports from the sugar industry have identified complementary policies. The industry–government partnership Sugar Research and Development Corporation (SRDC) has specifically identified management of the complex supply-chain relationships between producers, millers and distributors as a critical area for overcoming deficiencies and improving performance. In a similar vein, the SIRP 2004 Sugar Industry Oversight Group's Strategic Vision has identified that the industry must reduce costs through the supply chain and evaluate longer-term diversification to offset the effects of the deterioration in commodity prices. There is also increasing recognition of the challenges of incorporating social and environmental issues into policy.

ROLE OF GOVERNMENT

In recent years, agricultural industries have been responding to a range of drivers, including regulatory pressure, resource access, public opinion and the potential to provide market benefits by developing their own enterprise-scale farm-management systems. These systems (or tools) allow farmers to identify and manage their natural-resource risks and to measure, monitor and report their progress toward achieving sustainable resource use.

⁵ Agriculture and Food Policy Reference Group (2006). *Creating Our Future: Agriculture and Food Policy for the Next Generation*, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra. <http://www.agfoodgroup.gov.au/> (Accessed 25 June 2006).



About the WWF

Industry in partnership with the Australian Government has developed approaches to facilitate improved enterprise and industry level strategic planning, management and the definition of targets. In particular, effort has been focussed on developing environmental management systems (EMS) through the Pathways to Industry EMS Programme (Pathways) and the Environmental Management Systems National Pilot Programme (EMS Pilot).

'Pathways' has sought to engage industries directly in the development of environmental management system approaches that are relevant to profitable and sustainable farming systems, improved natural resource management and environmental outcomes, and the capacity to demonstrate environmental stewardship to markets and the community.

The 'EMS Pilots' program explored the capacity of EMS to deliver: NRM outcomes; profitable and sustainable business enterprises and improved market access. More recently, there has been strong recognition from both industry and governments across Australia that there is a diversity of farming systems and that no single approach will suit all farmers⁶.

The WWF has a strong emphasis on working with the agricultural sector.

WWF believes that responsible agriculture means that agricultural production and primary processing are undertaken in an environmentally, socially and economically sustainable manner.

Sugar production is one of a number of intensive forms of agriculture that can have a significant ecological footprint. It is for this reason that WWF and other interested parties established the Better Sugar Initiative; bringing together producers, financial organisations, researchers, major sugar buyers and other stakeholders to work towards the goal of responsible sugar production.

WWF believes that the credibility of initiatives such as this ultimately hinge on being able to demonstrate that adoption leads to a measurable reduction in key impacts. That is why the Better Sugar Initiative is taking a structured approach whereby agreement can be reached on key impacts, principles of better sugar production and targets, research priorities, identification and adoption of best management practices, and measurement of progress towards the targets.

It is very encouraging to see the diverse range of interests and parties in the supply chain participating in the Sugar Link project. It is WWF's hope that the Sugar Link project, and similar initiatives will provide the mechanism for sugar producers to be able to demonstrate responsible production and so respond to the growing market drivers seeking to support sustainable agriculture.

Andrew Rouse
Program Manager – Resource Conservation
WWF-Australia

⁶ For more information contact DAFF NRM Email: nrm.contact@daff.gov.au www.daff.gov.au/ems

CONSUMER DEMAND FOR SUSTAINABLE PRODUCTS

The increasing geographical distance between consumers and food producers has coincided with a mutual reduction in knowledge and awareness between these two ends of the supply chain. Consumers in large metropolitan cities (over 60% of the Australian population) are unlikely to have a strong understanding of the locations or production approaches of agriculture and food businesses. In a similar way, rurally based producers face difficulties in building a thorough knowledge of consumer choices and priorities of the urban population.

Consumer demands are constantly changing and multifaceted. Decisions on product purchase are based on criteria such as price, quality and health concerns that differ in importance from one consumer to the next. Research also indicates that the vast majority of consumers purchase food from the most convenient locations available, adding a further dimension to market planning and targeting.

Consumers are increasingly considering the environmental and ethical aspects of the foods they purchase. Concern about the sourcing of food products and the environmental impacts of production methods, as well as social issues such as child labour, equal opportunity and fair prices, characterises a growing segment of the consumer market. These consumers are purchasing for many reasons including lifestyle, health and altruism. Being able to trust the brand and the product are particularly important to these consumers.

Maintaining consumer trust in the safety and traceability of food products is understandably important to companies. Once consumers begin to doubt the credibility of a company, an institution or a regulatory system, it can be very hard to re-establish public confidence, with lasting consequences in the marketplace.





THE SUGAR INDUSTRY







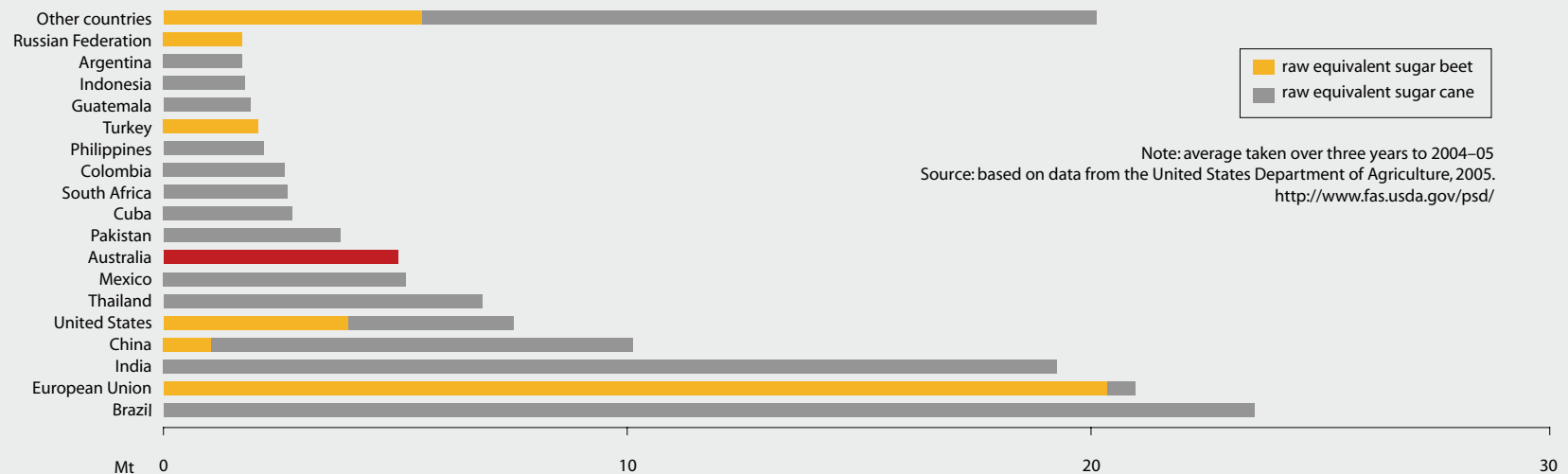
THE SUGAR INDUSTRY

Sugar is produced from sugar cane in countries with warm climates and from sugar beet in cooler climate countries. Cane sugar accounts for around 75% of all sugar production. Brazil, the European Union and India are the largest sugar producers (Figure 2). Australia produces raw sugar from approximately 8 million tonnes (t) of sugar cane per annum. In addition to producing sugar and ethanol from the cane stalk, the by-products of sugar production are used for the cogeneration of electricity, feedstock for animals, mulch for gardens and nutrients for farms.

RAW SUGAR

World raw sugar prices were depressed in the late 1990s, but have recently increased sharply, mainly due to increased demand for sugar for ethanol production in Brazil and lower sugar production in the European Union. The demand for ethanol as a substitute for oil increases as the price of crude oil increases. However, world raw-sugar production is increasing and this is expected to ease prices but not to the depressed levels of the early 2000s.⁷

FIGURE 2 WORLD RAW SUGAR PRODUCTION



⁷ Kinsella S (2006). Sugar outlook to 2010–11, *Australian Commodities* 13:55–60.

Australia produces 95% of its sugar cane in Queensland's subtropical and tropical coastal regions. Sugar is also grown in the Ord River in north Western Australia and in subtropical north New South Wales. Queensland supplies 98% of the Australian export raw sugar market.

There are four businesses operating multiple mills in Australia. Bundaberg Sugar Limited operates five mills, CSR Sugar operates six mills, Mackay Sugar Co-operative operates four mills and New South Wales Sugar Milling Co-operative operates three mills. There are also eight single site mill businesses. The distribution of total Australian raw sugar production is shown in Figure 3.

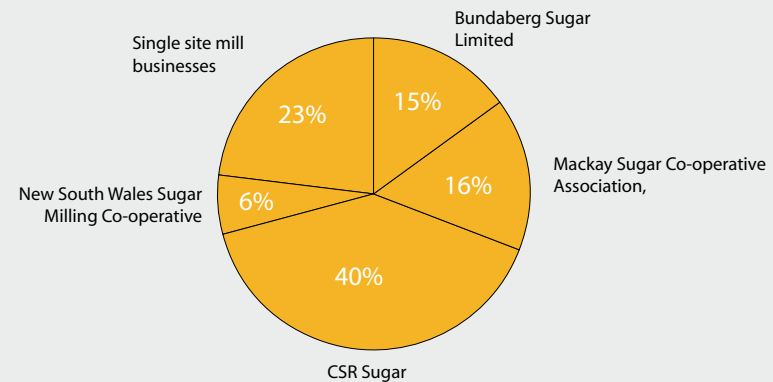
REFINED SUGAR

There are three refiners operating four refineries in Australia:

- » Manildra Harwood Sugars (MHS) is a joint venture between the New South Wales Sugar Milling Co-operative and the Manildra Group, operating the Harwood refinery in New South Wales
- » Bundaberg Sugar Group, operating the Bundaberg Refinery
- » Sugar Australia Limited, a joint venture between CSR Sugar and Mackay Sugar Co-operative Association Limited, operating refineries in Melbourne and Mackay.

The Queensland-based refining companies supply 75% of the domestic market and MHS 25%.

FIGURE 3 SHARE OF TOTAL AUSTRALIAN PRODUCTION OF RAW SUGAR MILLERS IN AUSTRALIA, 2004





NSW SUGAR





NSW SUGAR

The sugar industry has operated in northern NSW for more than 100 years. Originally there were many small mills that relied on the extensive river systems to transport sugarcane on punts. Over time, as cane was transported by road, the mills were consolidated to three: one in each catchment. Condong mill is in the Tweed river catchment, Broadwater mill in the Richmond catchment, and Harwood mill in the Clarence catchment. Road transport allowed the expansion of cane-growing areas beyond the river system. Harwood Mill crushed its first sugarcane crop of 25,550 t in 1874 at a rate of 10 t/hour. The mill can now process 250 t/hour and crushes 800,000 t/year.

The industry currently occupies approximately 34,000 ha of the northern rivers region of NSW, extending from near the Queensland border in the north to Grafton in the south. The industry provides direct and indirect employment for over 2000 people, and has an annual turnover of \$300 million.

A grower-owned organisation, the New South Wales Sugar Milling Co-operative Limited (NSWSMC), was formed in 1978 as part of the growers' acquisition of the region's milling assets from CSR.

NSWSMC has a board of directors elected by the growers, with three representatives from each mill catchment. There are no professional directors. Industry committees, generally, have equal numbers of representatives from the board and cane growers' council.

NSWSMC believes that the co-operative model of management ensures the commitment of industry stakeholders to the ongoing sustainability of the industry. As co-operative members, they have an investment in all aspects of production from growing, to the mill and refinery, to point of sale.



About NSW Sugar Milling Co-operative

NSW Sugar Milling Co-operative (NSWSMC) envisages a future where the industry operates in harmony with the environment and the community to grow sugarcane, and produce raw sugar, refined sugar, renewable energy and a range of value-added renewable products from sugarcane.⁸

Its future vision focuses on all parts of the sugar industry value chain — the value-adding activities. The centrepiece is the industry's diversification into electricity cogeneration, supported by a shift to whole-of-crop harvesting to provide the fuel source for new cogeneration facilities at the Condong and Broadwater sugar mills.

Cogeneration is both economically beneficial for the NSWSMC and its grower members, and provides environmental and social benefits to the communities that coexist with the region's sugar industry. It will allow the majority of the region's sugarcane growers to discontinue cane burning and thereby lessen the negative environmental and visual impacts of this practice.

Supporting this cogeneration strategy is a range of complementary reform initiatives, covering the harvesting of whole, green cane, enhancements to cane transport and other handling logistics, and further improvements to farm-level agronomic and environmental performance and community engagement.

Most of the waste from the production of sugar is used to produce other products. The fibre (bagasse) from the cane is used to fire the mills' boilers, providing self-sufficiency in energy. Mud extracted from cane juice and fly ash from the boilers are mixed and recycled to the farms as a soil conditioner and fertiliser. Another by-product, molasses, is sold to farmers as a feed supplement for dairy and beef cattle and is also used as a feedstock for fermentation industries. Based on these waste management practices and the adoption of best farm management practices (e.g. reduced fertiliser use, minimum tillage, reducing cane burning) the industry has the potential to move towards a 'closed loop' from an environmental point of view.

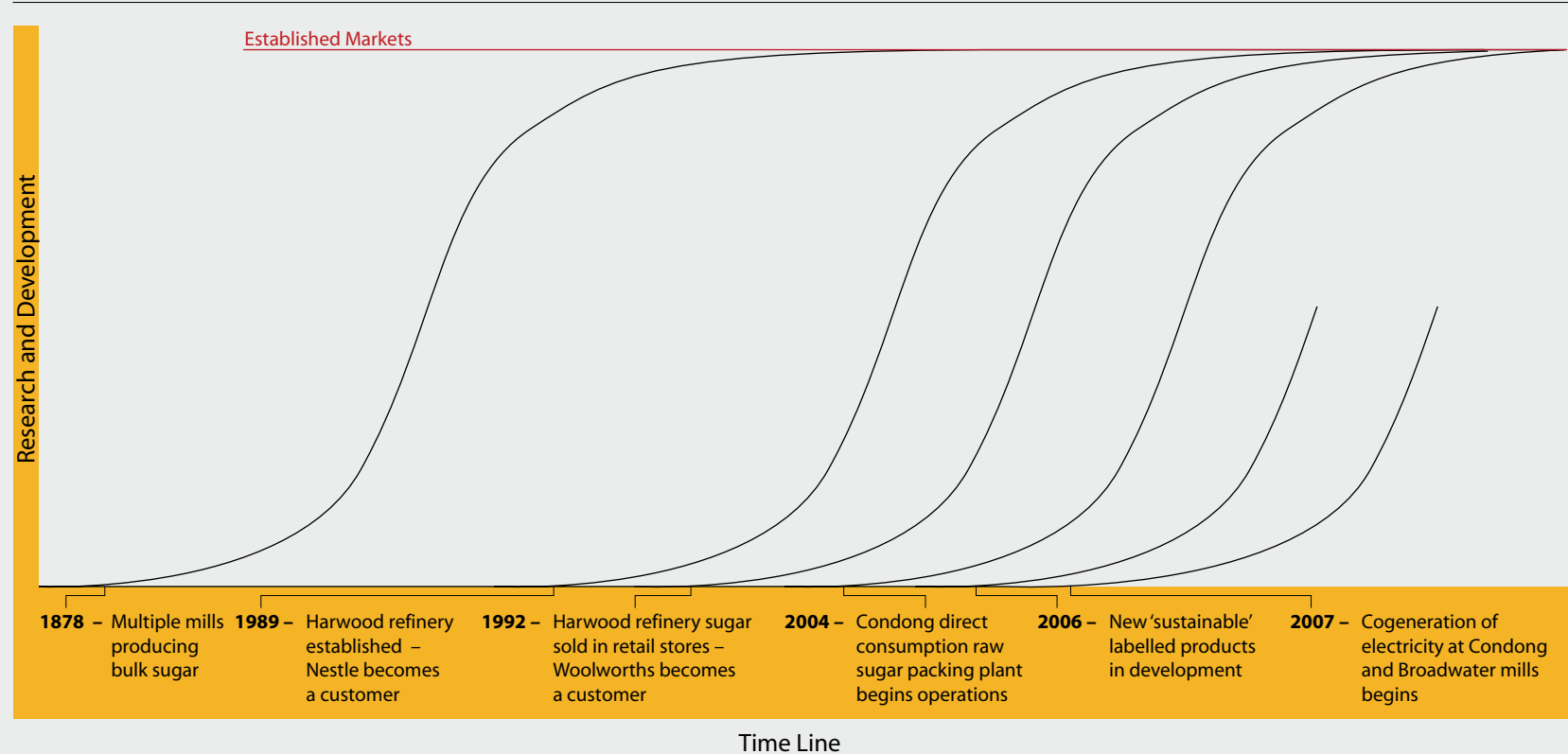
Developing the infrastructure for diversification takes time (Figure 4). NSWSMC has focused on expanding its infrastructure to enable product diversification since the 1980s.



⁸ This section is based on documentation provided by NSWSMC and on discussions during the Sugar Link workshops.



FIGURE 4 PRODUCT DIVERSIFICATION DIAGRAM



CULTIVATING SUGARCANE

Sugarcane grows on the coastal floodplains of the Tweed, Richmond and Clarence river catchments in north NSW (Table 1). It is grown in 'licensed cultivatable areas'. These sugar-growing zones are protected from urban development under current state planning regulations.

In some circumstances sugar cane can be considered to be carbon dioxide (CO₂) neutral, meaning 'CO₂ emissions from the crop and during milling and energy generation operations are balanced by

CO₂ accumulation by the crop.⁹ The industry is putting in place various processes to reduce greenhouse gases including more efficient transport routes and renewable electricity generation. Sugarcane is considered to be a significant 'sink' for greenhouse gases, particularly CO₂ and methane while actively growing. The term 'sink' is used to mean any process, activity or mechanism that removes a greenhouse gas from the atmosphere.¹⁰

TABLE 1 SUGARCANE PRODUCTION STATISTICS FOR NEW SOUTH WALES, 2000–2005

	Unit	2000	2001	2002	2003	2004	2005
Cane farms	no.	628	630	639	638	647	647
Area cultivated	'000 ha	34.3	35.2	35.8	36.1	35.8	36.7
Area harvested	'000 ha	18.7	19.8	20.6	20.0	20.2	17.8
Cane harvested	kt	1977.1	2089.9	2355.7	2310.5	2393	2393.9
Cane yield	t/ha	105.7	105.6	114.4	115.7	116.7	134.3

Source: New South Wales Sugar Milling Co-operative (2005)

⁹ Weier KL (1998). Sugarcane fields: sources or sinks for greenhouse gas emissions? *Australian Journal of Agricultural Research* 49:1–9.

¹⁰ UNFCCC (1992). *United Nations Framework Convention on Climate Change*. <http://unfccc.int> (Accessed 25 June 2006).



PLANTING

Sugarcane is planted in elevated beds from cuttings (approximately 20 cm long) of mature sugarcane stalks, known as cane billets. The mounds allow water to drain from the base of the plants.



GROWING

Soil preparation for planting involves laser levelling the paddock to drain evenly to one end. From planting to harvest, sugarcane takes 10–24 months to reach a mature height of 2–4 m. Tropical or subtropical climates are ideal for cultivating sugarcane because cane grows faster at higher temperatures. Sugarcane needs, on average, 1500 mm of rain per year to reach maturity. The average rainfall for the three NSW cane catchments ranges from 1600 to 2000 mm/year.



HARVESTING

Traditional harvesting of sugarcane involves burning the mature crop to reduce the biomass, or green vegetation. The harvester cuts the sugarcane stalks into billets, which are then loaded into field transporters and transferred to 23 t bins for transport to the mill.



TRANSPORT

Harvesting and transport efficiency is very important because sugar quality and content reduces over time. The time taken between harvesting the sugarcane and getting it to the mill should be less than 16 hours.



Growers' sustainability initiatives

The New South Wales sugar industry is located on the floodplains of three major rivers in a region that is undergoing rapid population growth and change. The coast and subtropical rolling hills appeal to a new demographic; many of whom have arrived from cities. Places such as Byron Bay have become internationally renowned tourist destinations. Lifestyle farmers now represent a significant part of the region's rural population, and tend to have a limited understanding of the sugar-production process¹¹.

In the late 1980s, water pollution from acid sulfate soils caused friction between the cane industry and the local community. The industry's response was to tackle the problem head on by first collaborating with scientists and then by developing guidelines and an education and monitoring program. Natural-resource management has now become an integral part of the sugar industry's culture. Cane growers say they have now gone beyond the 'us and them' attitude with the community and they are keen to demonstrate to visitors the many sustainable-farming practices they are now implementing.

PROPERTY MANAGEMENT SYSTEMS

There are two management approaches that have been broadly adopted by industry: one is the environmental management system (EMS) approach; and the other is Farming Codes of Best Practice or standards. These two approaches are not mutually exclusive. For example, a Code of Best Practice can sit within an umbrella EMS approach. EMS in Australia has evolved out of the International Standards Organization (ISO) 14001 certification system which has been successful for certain production systems. However, the complexity, resource intensive nature, and lack of clear market signals driving uptake have restricted broader adoption in some industries. EMS is an approach for managing environmental risks, and is generally implemented at the enterprise level. An EMS incorporates a plan-do-check-and-review approach to managing these risks but does not specify particular actions. The codes of best practice approach identifies those practices that are considered superior for production systems and environmental outcomes eg drain management and cover-crop rotations. Regardless of the approach an individual farmer chose to take Benchmarking performance against indicators and setting targets is a fundamental requirement of any property management system.

NSWSMC has established a code that sets best-practice standards for cane farming in the state — currently recognised farming techniques capable of delivering environmentally and economically sustainable sugarcane production. These practices are outlined in a publication¹²

¹¹ Aslin, H. (2006) Rural Lifestyle Landholders: Implications for Rural Policy Makers, Natural Resource Managers and Communicators. Science for Decision Makers. BRS, Canberra

¹² NSWSMC (2005). Industry Farming Code of Practice, New South Wales Sugar Milling Co-operative, Ballina www.nswsugar.com.au



that has been distributed to all the growers, and a sample of the practices are discussed below. The industry has strong leverage because the growers are totally reliant on the co-operative and the mill for processing their cane. With the exception of the drain-management plans that are audited by a third party, best practices are audited internally. A comprehensive and transparent system of benchmarking and reporting on all the practices is under development. The industry aims to have all farmers complying with these best-practice standards by 2008.

NUTRIENT AND FERTILISER USE

Nutrients and fertilisers should only be applied to soil and crops when required. Growers follow a checklist that includes soil tests and recommended fertiliser storage and application procedures, to ensure that no excess nutrients infiltrate groundwater, surface waters or contribute to greenhouse-gas emissions. As green harvesting is introduced, the industry will monitor the removal of green trash to ensure that a sustainable nutrient balance of biomass on the soil surface is maintained.



PEST AND WEED MANAGEMENT

The aims of pest and weed management are to minimise pest and weed numbers, reduce input costs to maximise profit, and ensure that herbicides are applied expediently. Herbicides are used to control weeds and small amounts of pesticides are used for some insect pests. An example of the industry's commitment to good use of pesticides is its response to a recently published study¹³ showing that the industry met the water-quality guidelines for the runoff parameters from tested drains, except for atrazine in one drain. In response, the industry has almost totally eliminated the use of atrazine; replacing it with less-mobile chemicals.

Soil health and conservation aim to maintain or enhance the productive characteristics of the soil, including physical, nutritional and biological health. Zero tillage and chemical weed control have reduced the:

- » use of cultivation, including use of rotary hoes — this has increased organic carbon, soil biota and other soil diversity
- » amount of topsoil blown away by wind.

Planting of soya beans as part of a fallow rotation has reduced the amount of nutrient inputs required, while increasing productivity and farm profitability. Direct planting of sugarcane into soya bean stubble as well as other cover crops is now being trialled.

¹³ Beattie R, Rayment G and Green B (2004). *Improving the Quality of Drainage Water from NSW Canelands*. Australian Society of Sugar Cane Technologists, Mackay.

ACID SULFATE SOILS AND DRAIN-MANAGEMENT PLANS

The industry has developed its own best-practice guidelines for the management of acid sulfate soils, and all producers are using these guidelines. The NSWSMC ensures mandatory compliance with drain-management plans through its cane-purchasing contract and a third-party annual-auditing program. Each year, 30 farms (10 from each catchment) are randomly chosen and inspected. In 2005, all farms passed. In the four years that the programme has been operating, only one farm has failed and in that case the problem was rectified within two weeks. The NSWSMC was awarded the RiverCare 2000 Gold Award for its project on reducing the outflow of acid sulfate soils in NSW cane lands.

VEGETATION MANAGEMENT ALONG CREEKS AND RIVERS

Riparian zones (land adjacent to creeks, rivers and drains) are important because they reduce the sediment runoff into water. This reduces eutrophication and damage to lower-catchment waterways. The best-practice objectives along creeks and rivers are to protect soil and water quality by maintaining stable soils and stream banks, controlling weeds and pests, and protecting riparian vegetation when burning or spraying.





WATER MANAGEMENT

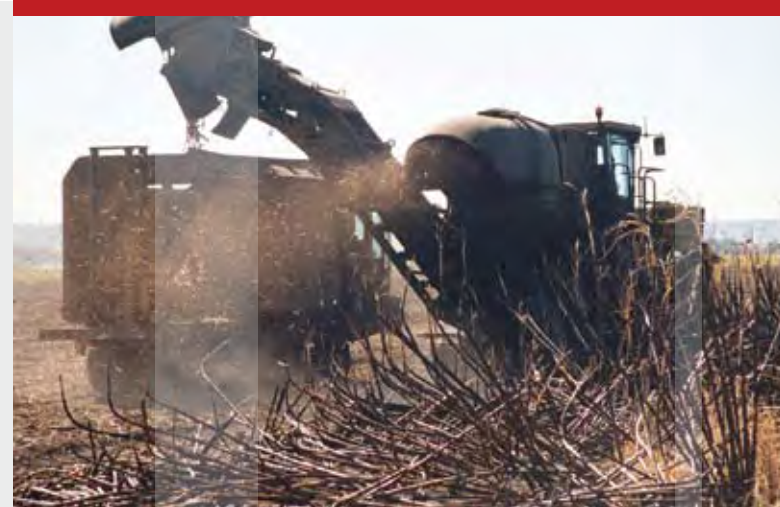
In NSW, the sugar crop is essentially not irrigated. Less than 1% of the crop receives supplement irrigation — usually for establishing the crop in an isolated area. Excess water carrying acids from acid sulfate soils in the region has resulted in environmental impacts in the past. These are now being avoided through management practices to reduce the discharge of acids into waterways, as discussed earlier.

Infrastructure such as data loggers and on-farm water monitoring are part of sustainable land-management practices. Data loggers in the Tweed catchment have meant that there has been continuous water monitoring and drainage measuring for more than two years.

WHOLE GREEN HARVESTING

The burning of cane is being phased out. 'Green whole-cane harvesting' has necessitated many changes to the harvesting process, including new harvesters to harvest both the cane and the leaves, large bins to transport the increased biomass to the mill and automated tarpaulin systems to prevent leaf matter from blowing from the truck during transport.

As a result of monitoring best-management practices, the industry believes that growers have observed how they have reduced chemical residues, nutrients and contaminants in the water.



Profile of an innovative grower

"Tweed Valley sugarcane grower Robert Quirk has won the 16th McKell Medal for excellence in natural resource management. Mr Quirk has run a 200 ha cane farm at Duranbah in northern NSW for the past 44 years."

In a media release announcing the McKell Medal winners Minister McGauran said 'Robert Quirk has made a major contribution to better natural resource management, particularly in relation to intensive cane growing on acid sulfate soils, and is a worthy recipient of the McKell Medal'.

"Chosen from a field of 21 outstanding candidates, Mr Quirk has a long-standing interest in innovative agriculture in finding better ways of sustaining the soil and increasing crop production, and reducing chemical use and the harmful effects of effluent.

"His approach to farming the Tweed Valley's acid sulfate-rich volcanic and tidal soils, for example, has enabled him to reduce chemical use by 25%, decrease heavy metal and acidity discharge by 80%, and increase productivity by 38%.

"Many of the practices Mr Quirk has developed are now considered world's best practice for farming acid sulfate soils. Not surprisingly, the Quirk family farm at Duranbah has become a popular stopover for politicians, growers, engineers, tourists and students.

"He has also played a key role in developing the NSW SMC Cane Industry's Best Management Guidelines for Farming Practices and for Acid Sulphate Soils."

Source: Extracts from a Media Release. "Tweed Valley cane farmer wins the McKell Medal" 21 April 2006

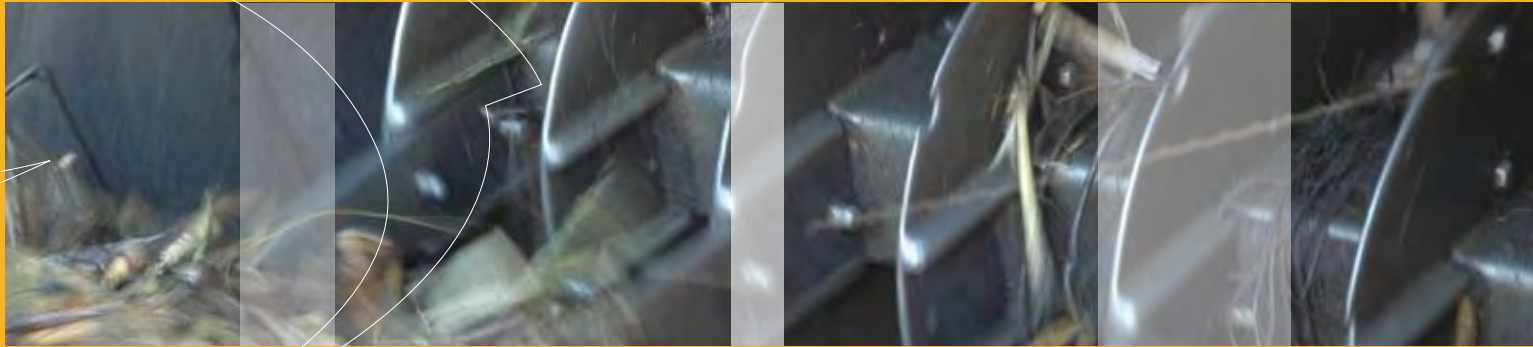


Robert Quirk and Sugar Link participants visiting cane farms in the Tweed valley





MILLING SUGAR





MILLING SUGAR

The New South Wales Sugar Milling Co-operative (NSWSMC) wholly owned mills at Condong, Broadwater and Harwood produce around 270 kt of raw sugar from about 2.5 million t of cane in a 'normal year' crop. In the 2005 growing season, the industry produced around 274 kt of raw sugar from a harvest of 2.39 million t of sugarcane. Table 2 shows that harvest over the past five years has been relatively stable.

Farmers are paid for their cane based on its sugar content (CCS), which reaches a maximum for a short period of the harvesting season. The harvest schedule is allocated among farmers in the co-operative in such a way that the benefits of harvesting at the optimal time are equitably shared; parts of each farm are harvested at different times during the season. Each mill requires a certain minimum amount of cane to ensure its viability.

Most of the region's raw-sugar production is sold to a sugar refinery co-located with NSWSMC's Harwood mill. The refinery is a 50:50 joint venture between NSWSMC and the Manildra Group, known as

Manildra Harwood Sugars (MHS). Refined sugar is sold by the joint venture on the domestic sugar market. MHS commands a 25% share of the Australian refined sugar market, and its refinery produces sugar under the brand name 'Sunshine Sugar'. The remaining raw sugar produced by NSWSMC is sold to the export raw-sugar market.

Around 150 products are marketed by MHS. These include different sugar package types and sizes as well as various sugar mixtures for direct factory production (eg liquid sugars for soft drinks and inputs to pharmaceuticals).

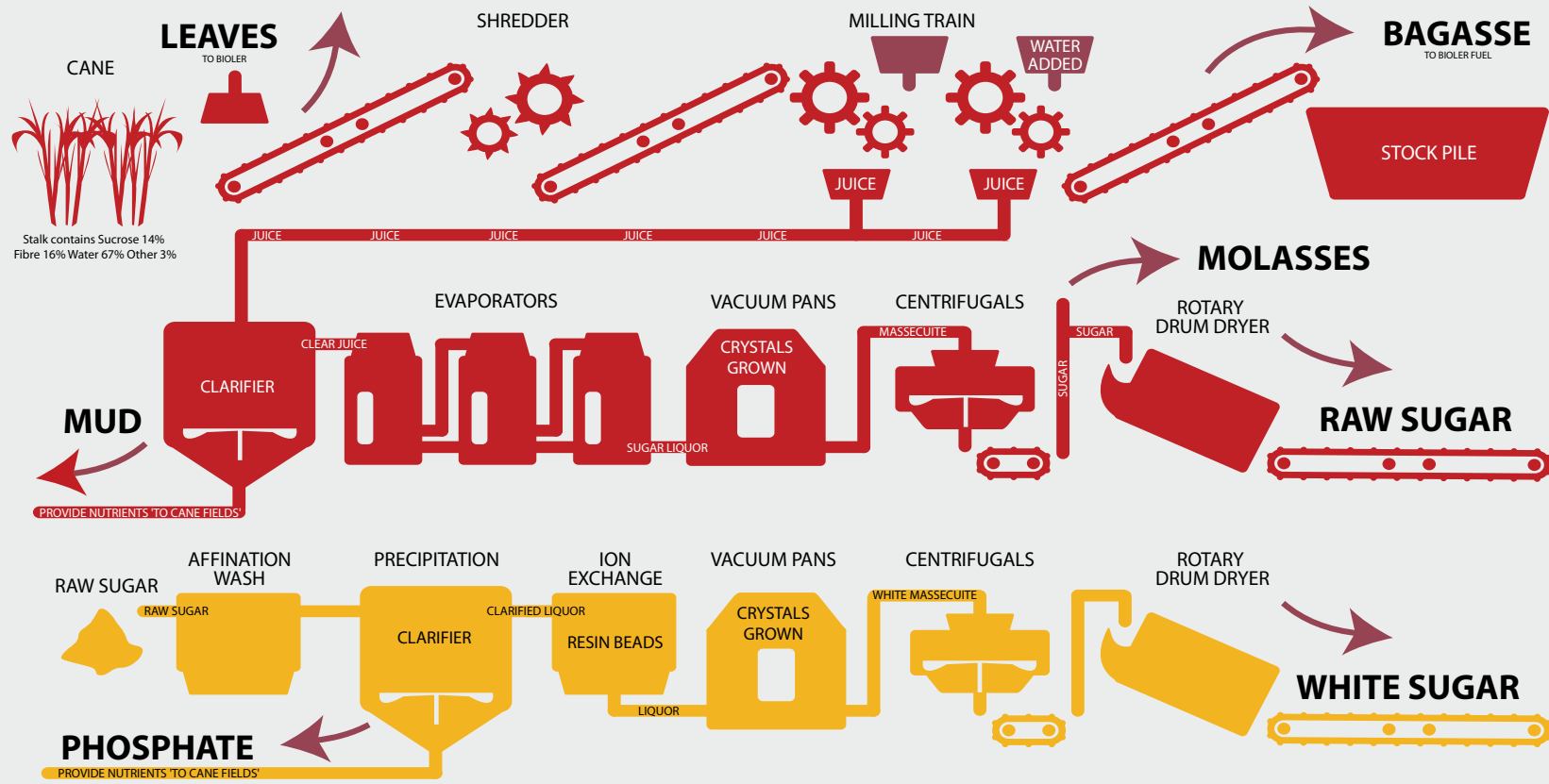
The Condong Mill produces and packages direct-consumption raw sugar for Woolworths Home Brand label at the packaging plant that was opened in 2004. Direct-consumption raw sugar is of a high quality and specially handled and packaged as a food-grade product. The remaining sugar from Condong, Harwood and the Broadwater mills is sent to the MHS refinery for further processing.

TABLE 2 HARVEST FROM CONDONG, BROADWATER AND HARWOOD SUGAR MILLS

	Unit	2000	2001	2002	2003	2004	2005
Cane crushed	kt	1977	2087	2356	2305	2360	2394
Raw Sugar Production	kt	246	255	288	276	289	274.4
Sugar Content (CCS)	%	12.4	12.2	12.2	12.0	12.2	11.5

Source: New South Wales Sugar Milling Co-operative (2005)

FIGURE 5 MILLING AND REFINING SUGAR





The processes involved in milling and refining sugar are outlined in Figure 5. Sugarcane is harvested between June and December, but the refinery requires an all-year-round supply of raw sugar. Therefore, raw sugar is stockpiled for the six months when there is no harvesting in operation. Similarly, cogeneration of electricity also needs a continuous supply of biomass to fuel the boilers, so excess biomass is also stored.

1. CANE PROCESSING

Upon arrival at the mill, the sugarcane is weighed. The stems are stripped of leaves and the sugarcane billets are moved to the shredder for grinding. Leaves are conveyed to the boilers for use as fuel and any excess is taken to the stockpile for use in the off season.

2. EXTRACTING JUICE

The cane is fed through a series of mill rollers to extract the juice. Hot water is sprayed onto the crushed fibre before the final mill to remove the remaining sugar juice.

The resulting fibre from this process is known as bagasse, which is used as a fuel in the mill's boilers for steam production and the cogeneration of electricity. On average, 1 t of sugarcane billets yields 300 kg of bagasse.

3. CLARIFYING

Lime is added to the raw juice to entrap impurities (mud), which settle to the bottom of a clarifier or settling tank. The mud is mixed with ash from the boilers and used as a fertiliser on cane farms and gardens. The clear sugar juice flows from the top of the clarifier.

4. EVAPORATING AND BOILING

Water is evaporated from the clear juice to leave a thick syrup. The evaporation occurs in a partial vacuum that enables the syrup to be boiled at around 70°C to avoid caramelising the sugar.

5. CRYSTALLISING

Crystals are grown through crystallisation in vacuum pans. The syrup is seeded with fine sugar crystals that provide sites for new crystals to grow. The resulting mixture of crystals and molasses syrup (called massecuite) is separated in centrifuges; the centrifuge wall has small holes through which the molasses syrup flows out, leaving behind the raw sugar. The raw sugar is sprayed with water to assist the final removal of molasses. The raw sugar is then tumble-dried and conveyed to bulk storage or directly to the refinery.

6. REFINING

Raw sugar is typically 99% pure sucrose. Sugar refining is the process of further purifying the raw sugar to around 99.95% sucrose. The process is similar to the production of raw sugar in the mill. First, the raw sugar is mixed with heavy syrup at approximately 60°C and then centrifuged clean (in a process known as affination). The sugar crystal is then dissolved in water to form a cloudy amber-coloured liquor. The cloudy particles (impurities) are removed by precipitation in a clarifier. The product, known as clarified liquor, is passed through deep-bed sand filters and an ion-exchange column (of resin beads) to remove colour and to produce fine liquor. The fine liquor is then passed through an evaporator and into the vacuum boiling pans where crystallisation takes place. The crystals are separated from the syrup in centrifuges and passed through an air dryer. The dried white sugar is then graded and packed into various sizes for retail and industrial requirements, ranging from 1 kg to 40 t.

Millers' sustainability initiatives

The New South Wales Sugar Milling Co-operative (NSWSMC) is involved in several initiatives to improve transport efficiency and thereby reduce carbon emissions. It is currently redesigning the location of cane pads — the collection areas from where the sugarcane is transported to the mill. By filling in the gaps in the collection grid, NSWSMC will reduce the distance travelled and fuel used by off-road vehicles. This will also speed up the collection process and therefore improve harvesting efficiency.

Transport from the cane pads to the mill is controlled by the mill itself. Each vehicle is fitted with a global positioning system (GPS) and they can be tracked by the mill to assist in scheduling cane input to the mill. Waypoints along the truck routes recalculate the truck's estimated time of arrival at the mill as it travels. In the future, the GPS will be used to navigate the harvesters through large green crops and could enable extended hours of harvesting to smooth the flow of cane from farms to the mill even further.

Each cane-collection bin has an identification number and a radio frequency identification tag containing a silicon chip that enables it to respond to radio-frequency enquiries. The chip is attached to the bin and can be accessed remotely; enabling the mill control centre to track all the bins.

Air emissions will be reduced by the replacement of the old boilers at the Condong and Broadwater mills with new boilers and more-efficient emission-control systems. This will enable stack particulate emissions at Condong to be reduced from 400 mg/m³ to less than 100 mg/m³.

Tertiary-treated effluent from the Tweed Shire Council's sewerage treatment works will be used for cooling-tower make-up water at Condong's new power station, which will thereby reduce the amount of effluent that is discharged to the Rous River from the treatment works. A similar use of tertiary-treated effluent at the Broadwater mill from a proposed nearby sewerage-treatment plant is under consideration.



Verification

Both Manildra Harwood Sugars (MHS) and the New South Wales Sugar Millers Co-operative (NSWSMC) are required to meet specific regulations and customer requirements in order to produce and sell their products.

Verification schemes are primarily targeted at food safety and quality, with some certification also available for environmental attributes of farm production and food processing. The Better Sugar Initiative, supported by WWF, promotes the importance of broader monitoring and inclusion of social and environmental processes.

In general terms, there are three types of certification:

- » third-party — undertaken by an organisation that is independent of the manufacturer seeking certification, eg hazard analysis and critical control point (HACCP) food safety accreditation

- » second-party — undertaken by the purchaser to their specific requirements
- » self — where the manufacturer or producer takes responsibility for certifying conformity of the product to an agreed code of best practice.

Whilst most MHS customers accept independent third-party certification, some of the larger customers conduct their own second-party audits for their specific company requirements or standards. Some of these are listed in Tables 3 and 4.

TABLE 3 THIRD-PARTY CERTIFICATION

Standards certified to	Sites	Independent auditors
HACCP	MHS (all sites)	Agriquality
True Quality	MHS (all sites)	Agriquality
Halal	MHS, NSWSMC (all sites)	Halal Certification Authority Australia
Kosher	MHS, NSWSMC (all sites)	NSW Kashrut Authority
Organics	MHS (Murwillumbah)	Australian Certified Organics
Woolworths Quality Assurance	MHS (Harwood, Condong, Murwillumbah)	Sci-Qual International
Acid Sulphate Soils	NSWSMC (all sites)	Local council NSW Dept of Primary Industries NSWSMC Bureau of Sugar Experimentation Stations

TABLE 4 SECOND-PARTY CERTIFICATION

Requirements	Sites
NSW Department of the Environment and Conservation	MHS, NSWSMC (all sites)
Specific Customer Requirements	MHS (all sites)

MHS = Manildra Harwood Sugars; NSWSMC = New South Wales Sugar Milling Co-operative

HACCP = hazard analysis and critical control point; MHS = Manildra Harwood Sugars; NSWSMC = New South Wales Sugar Milling Co-operative

Challenges for NSW Sugar Milling Co-operative

There are many challenges ahead. On average, cane farmers have been in the industry for over 30 years, so managing intergenerational change is important. Another issue is to reduce the seasonality of income flow in mills given the six-month harvesting season. Year-round electricity generation will help ensure more secure employment for the mill employees.

While the industry aims to have all farmers complying with the best-management-practices guidelines by 2008, the industry needs to continue to develop knowledge about the ecosystem and cane production. Of key importance is to learn more about practices that increase soil carbon, improve water-use efficiency, and manage the impacts of drought.

The industry has well-developed internal communication — a monthly newsletter and various forums provide opportunities for growers and mill staff to share new ideas and knowledge. As part of its community engagement program, The Sunshine Sugar Community Support Programme provides donations, sponsorship and prizes to a wide range of community groups, shows, schools and clubs. However, communication between industry and the broader community requires further development. The community's perceptions are important. People do not like the burning of cane, primarily because the ash falls over pools, roofs and gardens, and they are also concerned about trash from sugar production on the roads and about water quality. There are many benefits of using better practices on farms

as they result in broader benefits for the whole catchment, and it is important that the community is kept informed about these initiatives. Continued population growth and change in the region, combined with the limited understanding of the sugar-production process, requires a proactive, ongoing, community-engagement strategy. To support this strategy, a transparent system of monitoring and sustainability reporting is advisable to create a positive and informed foundation for ongoing dialogue across diverse interest groups.

A major issue for the industry is to build stronger relationships with their supply chain partners. To effectively meet market demand, it is essential to keep the retail and manufacturing sectors informed about opportunities and constraints in the agricultural sector and for the agricultural sector to establish a dialogue with the manufacturing and retail sectors about product requirements and consumer purchasing choices. Increasing knowledge about each supply chain stakeholder's specialist knowledge and perspectives is difficult because the operating environments are very different. Therefore the industry needs to establish regular forums to share knowledge and ideas. In the following section three major customers of NSWSMC are briefly discussed. Each of these customers, Delta Electricity, Nestle' and Woolworths have provided documentation and input into the Sugar Link workshops. This has enabled NSWSMC to gain an understanding of what happens to sugar after the mill and refinery, the scale of the companies operating environments, the markets they service and their policies on sustainability and the supply chain.



ELECTRICITY







SUGAR-MILL COGENERATION WITH DELTA ELECTRICITY

Delta Electricity has formed a partnership with the New South Wales Sugar Milling Co-operative (NSWSMC) to produce electricity. Cogeneration is the combined production of power (usually electricity) and heat¹⁴ using fuel such as bagasse and trash; collectively known as biomass. The steam drives two processes:

- » low-pressure steam is used for heating in the sugar mill
- » high-pressure steam drives the turbine generators to make electricity and to run the mill engines.

Cogeneration is significant in the sugar-production process, because the process uses the biomass material to create its own energy, resulting in cheaper running costs for the mills.

The Tweed and Richmond areas harvest approximately 22,000 ha of cane to produce 55 kt of bagasse to generate 400 GWh of electricity. There is enough biomass material to generate power all year, not just during the six-month harvest season. Excess biomass is stockpiled with other material, including harvested camphor laurel trees, a noxious woody weed in the northern NSW region.

This cogeneration project is the largest renewable energy project in NSW as Broadwater will produce 30 MW and Condong will produce a further 30 MW. Both will commence generating electrical energy in 2007. All Broadwater and Condong output will be sold as renewable energy under the Australian Government's mandatory renewable energy target.

There are many benefits to this partnership. The practice of burning sugarcane before harvest will cease in the Tweed and Richmond catchments with the new cogeneration furnaces; in future, the green trash will be used for electricity production. The Harwood sugar mill on the Clarence River has not been converted to cogeneration, but continues to produce enough power to run its own milling processes. Other benefits include:

- » reusing effluent water in the Condong cogeneration plant
- » reducing ash and improving air quality
- » reducing greenhouse gases through replacing 400 GWh of coal fuel on the electricity grid. This is an effective saving of 360,000 t of carbon dioxide from non-renewable sources.

¹⁴ Delta Electricity (2002) Sustainable Energy Innovation. Ed. Stephen Schuck. Delta Electricity, Sydney

A major advantage for the sugar industry is that, unlike purpose-grown energy crops, sugarcane incurs no additional transport costs or carbon dioxide because the cane is already being transported to the mill. Economically, cogeneration adds approximately 10% value to the crop and reduces exposure to the bulk-commodity markets by increasing the diversity of income.

To diversify into cogeneration, the growers and the mills have had to make considerable improvements in their production process to eliminate downtime and maintenance to ensure timely and consistent cane handling and delivery. The industry claims that this has encouraged the growers to see the benefits of sustainable sugar production and product diversification.

Cogeneration will help build NSWSMC's reputation as an agricultural business committed to diversifying and building new strategic partnerships. It is envisaged that the project will also build relationships with the local community and provide education and tourism opportunities. In essence, the mills will provide a more

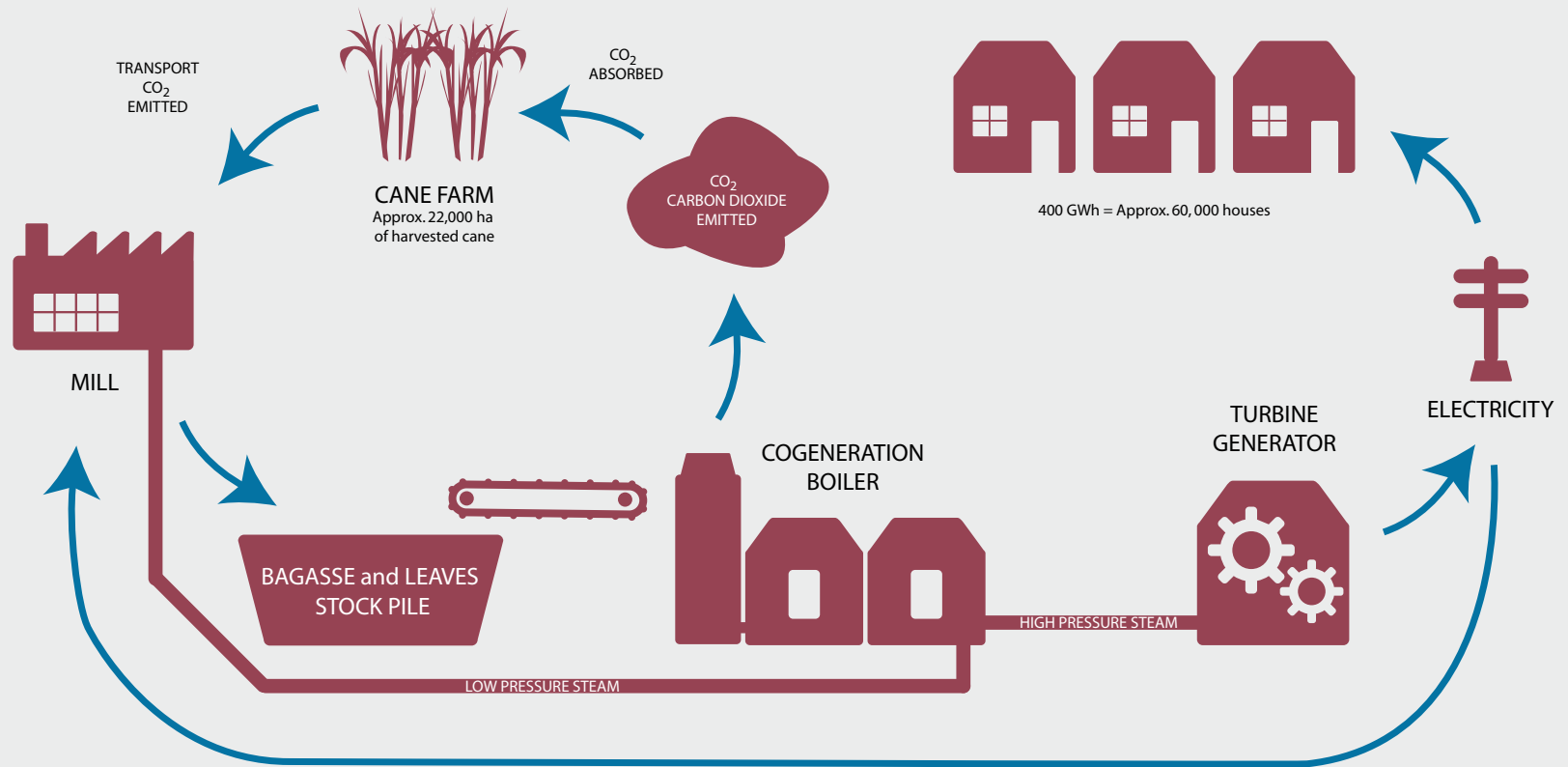
reliable power supply for approximately 60,000 houses and help to reduce the risk of unplanned power outages. The process of cogenerating electricity in this way is outlined in Figure 6.

NSWSMC and Delta Electricity have committed to this important initiative because of the many benefits arising from a cogeneration project which uses a renewable fuel source. Importantly, it will help meet growing consumer demand for energy from renewable sources while making a substantial contribution to Australia's greenhouse abatement commitments and at the same time, provide an economic benefit to the sugar industry.





FIGURE 6 COGENERATION OF ELECTRICITY USING SUGARCANE WASTE



ELECTRICITY

About Delta Electricity

Delta Electricity is an electricity-generation corporation. It was formed on 1 March 1996 and currently employs 728 people. Delta's generators produce approximately 12% of the electricity needed for the national electricity market; meeting the needs of consumers across the east coast of Australia.¹⁵

Most of Delta's generation comes from the operation of four coal-fired power stations in New South Wales: Mt Piper and Wallerawang near Lithgow, and Vales Point and Munmorah on the Central Coast. The remainder of Delta's generation is from renewable energy sources.

With Australia currently reliant upon coal for the majority of its electricity, Delta believes long-term sustainability is the outcome of a process which balances the social, economic and environmental needs influencing electricity generation. Delta is a signatory to the Energy Supply Association of Australia's Code of Sustainable Practice (2005) which sets out the industry's requirements for achieving sustainability. It is the public acknowledgment of the commitment of the signatory to sustainable development.

In terms of ecological sustainability, Delta relies on the following principles:

- » the precautionary principle — if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- » inter-generational equity — the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- » conservation of biological diversity and ecological integrity
- » improved valuation and pricing of environmental resources.

Delta's approach to a sustainable future for electricity generation comprises:

- » minimising impacts of existing coal fired plants by improving thermal efficiency
- » investigating technologies to reduce greenhouse gas intensity
- » developing new renewable energy technologies for the future.

Delta Electricity's renewable energy commitments are a key platform in its sustainable development strategy. Programs include biomass co-firing, cogeneration and mini hydro generation.

¹⁵ This section is based on documentation provided by Delta Electricity and on discussions during the Sugar Link workshops.



CONSUMPTION







SUGAR CONSUMPTION TRENDS

Sugar faces strong competition from other sweeteners in consumer diets, particularly from high-fructose syrups. There are also adverse perceptions of sugar of some consumers, particularly in developed countries, because of concerns with links to dental health and obesity. The Dietary Guidelines for all Australians¹⁶ include advice to 'consume only moderate amounts of sugars and foods containing added sugars.'

The overall level of food sugar consumption has been fairly steady at around 40 million t/year in developed countries, but has grown strongly in developing countries. There is a general trend for sugar consumption to increase as a country's income increases. However, in developed countries, there has been strong growth in the sweeteners that compete with sugar, especially sweeteners with low calorific content.

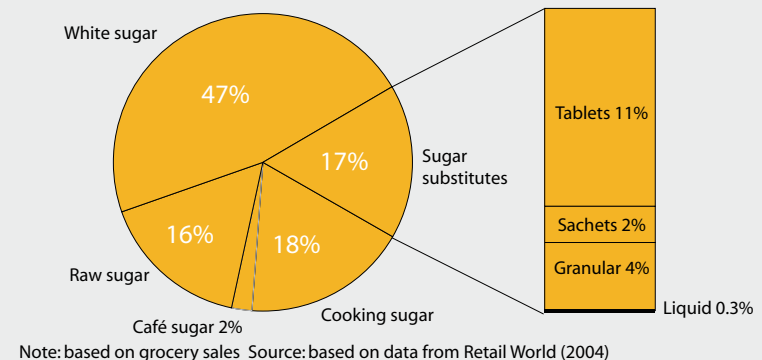
The retail market for sugar in Australia is differentiated according to brands with the 'CSR', 'Bundaberg' and 'Sunshine' brands commanding price premiums. As with other products in supermarkets, the sugar brands with the highest turnover are put on supermarket shelves at the most convenient level for loading into a shopping trolley, which is waist height or lower.

The major retailers apply their private labels to a wide range of the products they stock. In Australia, the main private labels are Home Brand (Woolworths), Farmland and Savings (Coles), Black and Gold (IGA) and No Frills (Franklins).

Sugar labelled under the Woolworths' Home Brand is mostly sourced from the NSW sugar industry, which won the contract to supply Woolworths through an open tender that specified requirements to be met such as volume, quality and packaging.

Retail sugar sales are declining, except for café and sugar substitutes, mainly due to consumer perceptions regarding health. The price of sugar declined from \$2.03 for a 2 kg Home Brand pack in 2001 to \$1.73 in 2004 largely due to low world sugar prices which have recovered considerably in 2006. The volume of sugar sales is not likely to increase in the future, so there needs to be a focus on value-adding. The market share for different sweeteners in Australia is shown in Figure 7.

FIGURE 7 MARKET SHARE OF RETAIL SALES OF SWEETENERS IN AUSTRALIA, 2003



¹⁶ NHMRC (National Health and Medical Research Council) (2003). Dietary Guidelines for all Australians, NHMRC, Canberra. <http://www.nhmrc.gov.au/publications/synopses/dietsyn.htm> (Accessed 25 June 2006)

BULK SUGAR FOR NESTLÉ¹⁷

The sugar supply chain is important to Nestlé Australia Limited. In 2004, Nestlé total production used 440 kt of sugar, of which 30 kt was supplied by MHS to Nestlé factories in Australia, including the Blacktown site for medicated confectionery, the Echuca factory (chilled dairy, yoghurts and desserts), Tongala factory (liquid and powdered milks) and Smithtown factory (Milo, Nesquik). Smithtown uses approximately 6300 t (540 t caster and 5760 t refined sugar), all supplied by MHS.

MHS supplies Nestlé with various sugar packages and mixtures for direct factory production including:

- » **refined sugar, bottlers' grade** — a premium-refined sugar that has been graded and specifically designed for use in products that are sensitive to colour. It is a white, free-flowing, crystalline material with a characteristic sweet flavour and no odour
- » **refined sugar, manufacturers' grade** — a white, free-flowing, crystalline material with characteristic sweet flavour and odour, free from extraneous matter. Manufacturers' sugar is a graded product, suitable for most food- and beverage-processing applications. Nestlé uses refined sugar in Milo and Nesquik
- » **caster sugar** — graded to ensure a uniform, fine-grain product suitable for specialist applications, such as those requiring textural differences in bakery products or fast-dissolving characteristics. Caster sugar is a white, free-flowing, crystalline material with characteristic sweet flavour and odour, free from extraneous matter. Nestlé uses caster sugar in its vending machine products, including Nescafe latte and hot chocolate

- » **liquid sugars** — refined liquid sugar products made by remelting low-colour granular sugar that contains few impurities to produce viscous, clear, pale straw-coloured sugar syrups. Bottlers' grade liquid sugar has been specifically designed for use in products that are sensitive to colour, whilst manufacturers' grade liquid sugar is suited to most food- and beverage-processing applications
- » **golden syrup and treacle** — made from the blending and partial inversion of refined sugar streams from Australian raw sugar at the Harwood refinery in northern NSW. Viscous, clear, golden-coloured sugar syrup with characteristic strong flavours and aromas, treacle is darker in colour and stronger in flavour than golden syrup
- » **raw sugar** — a partially refined, brownish product that contains the natural molasses present in sugarcane. It has coarse, consistent grains of sugar. Raw sugar enhances flavour and is light brown in colour. It is suitable for use in a range of food and beverage applications
- » **Sunsweet/invert syrup** — a purified, concentrated, aqueous solution of nutritive saccharides, produced by the controlled hydrolytic inversion of liquid sugar. Sunsweet is viscous, clear, light golden-coloured syrup with characteristic flavours and aromas. It is used where a high fructose content is preferred, such as in confectionary and beverage manufacturing.



About Nestlé

Nestlé is the largest food company in the world and the 31st largest company in the world. About 95% of its trade is in food and beverages. It has around 5800 employees and 479 factories globally. In the Oceania region, there are 4700 employees, and sales of around \$2.8 billion. Nestlé sees itself as more than a 'food' company rather as a 'health, nutrition and lifestyle' company.

Nestlé focuses on being an ecologically responsible company, with a particular emphasis on sustainable development. The company's sustainability review in 2002 identified sustainable development in the Nestlé context as 'the process of increasing the world's access to higher-quality food, while contributing to long-term social and economic development, and preserving the environment for future generations.'

The growing demand for raw materials is a crucial issue for Nestlé, given the increasing world population, coupled with higher disposable incomes and consequent increase of protein diets.

Nestlé is a founding member of the Sustainable Agriculture Initiative (SAI). The objective of SAI is to support agricultural practices and production systems that preserve the future availability of current resources and enhance their efficiency. While SAI is primarily focused at the farm level, it is a platform for the food industry to have a communication channel between food-industry members and stakeholders. A key feature of Nestlé's global strategy is to locate aspects of production in the developing world, with 45% of factories and 48% of employees located in developing countries. Nestlé applies the following principles when sourcing raw materials:

- » all raw materials must meet both legal and internal quality criteria, including limits on possible environmental contaminants
- » whenever possible, preference is given to raw materials that are produced by environmentally sound farming methods
- » farmers are encouraged to apply sustainable-farming methods and, where appropriate, are provided with assistance in crop production.



PACKAGED SUGAR FOR WOOLWORTHS

New South Wales Sugar Millers Co-operative (NSWSMC) and Manildra Harwood Sugars (MHS) (under the name Sunshine Sugar) supply 'Home Brand' sugar to Woolworths. All suppliers to Woolworths have to comply with the Woolworths quality assurance standard. The standard requires all Woolworths-branded products to meet minimum hazard analysis and critical control point (HACCP; food safety), storage, packaging and handling standards. Retail sugar is refined cane sugar graded to provide a uniform crystal size to enhance product texture and consistency. Retail sugar crystals are white in colour and odourless. MHS sells various packages of retail sugar for cooking and other domestic uses. MHS supplies Home Brand 'white sugar' from the Harwood

refinery and Home Brand 'raw sugar' and 'organic raw sugar' from the Condong mill and Murwillumbah packing plant. Home Brand sugar is the largest selling brand in Australia.

Woolworths has a streamlined, computerised store-stacking system. Trolleys for each aisle have allocated numbers of products to collect and deliver to shelves. Shelves are stacked at night. The strategy is to keep shelves constantly stacked with products. If there are too many different types of sugar, some sections will remain as empty space (dead sale area). Hence, Woolworths limits the number of suppliers and different sugar products it stocks; partly due to space constraints and partly due to other logistics. Woolworths has specific





space allocations for Home Brand and competing manufacturers (CSR sugar). If a product performs well, it may get more shelf area allocated to it. Woolworths stock 1 kg, 2 kg and 3 kg packages of Home Brand sugar, and also the new Sunshine Sugar tetra packages. The pack (picture) was designed to easily fit in with the store stacking system. Woolworths and NSWSMC have also been developing a new sustainable-labelled sugar product.



About Woolworths¹⁸

Woolworths Limited is the largest supermarket chain in Australia. It employs over 170,000 staff, or 1 in 59 working Australians, and has a presence in most Australian communities. Woolworths operates more than 1600 stores in Australia, plus an additional 33 Dick Smith Electronics stores in New Zealand. Total annual sales exceed \$27 billion.

The company has worked to ensure appropriate strategies are in place in relation to five key environmental impact areas:

- » electricity consumption and associated greenhouse gas emissions
- » waste from stores going into landfills and recycling
- » packaging used in operations and by customers
- » fuel consumption and associated greenhouse gas emissions from vehicle fleet
- » petrol storage and management of leakage/spillage risks.

As a significant retailer, Woolworths' energy footprint is not only dictated by the store environment, but by the entire supply chain. As such, Woolworths' main focus is on its end-to-end supply chain improvement program. The supply chain strategy requires a 'whole of business transformation' to develop cost efficient logistics systems, processes and facilities. Further supply chain objectives include improving waste minimisation and recycling efforts.

Another example of the supply chain improvement initiative is to reduce trucking miles. Currently, approximately 60% of trucks are empty and to minimise this, Woolworths is developing routes to backfill trucks with farm produce. This provides benefits both in reducing the energy usage and in providing timely transport to farm suppliers.

Woolworths has over 30,000 suppliers operating in a wide range of commercial sectors. By building stronger partnerships, they can realise many benefits, including:

- » leveraging each other's strengths and challenging each other
- » aligning strategies and objectives
- » improving the business planning process and execution
- » becoming more innovative and taking more risks
- » focusing on consumer demand rather than existing production.

Woolworths has a strong focus on health, convenience and taste. Their research indicates that their customers want: efficiency when shopping; value though consistent, best possible pricing; confidence in the quality, freshness, safety and dependability of the store; to feel that their custom is appreciated; and exposure to new ideas and trends in a dynamic environment.

¹⁸ This section is based on documentation provided by Woolworths and on discussions during the Sugar Link workshops.



OPPORTUNITIES





MARKET DIVERSIFICATION AND COLLABORATION

Agriculture is the source of many products, not just food. Textiles, paper, fuel, electricity, building materials and pharmaceuticals are just some of the many farming products that we use everyday.

The current sustainability initiatives, the development of the cogeneration of electricity and the associated activities for using the whole sugar crop, will take a couple of years to establish. Whole green crop harvesting is a process that spans the farm and factory. It is a pioneering process that has not been previously implemented anywhere in the world, and the infrastructure will take time to establish.

Once the infrastructure is in place for whole-of-crop harvesting, NSWSMC and its supply chain partners can explore developing further diversification opportunities (Table 5). The new infrastructure will provide steam and power all year round, enabling NSWSMC to expand and use the low-pressure steam for processes other than milling. Some market-diversification options are dependent on new technologies, such as bioplastics. These may eventuate over a 5–10 year development timeframe.

TABLE 5 POTENTIAL DIVERSIFICATION OPPORTUNITIES FOR THE NEW SOUTH WALES SUGAR INDUSTRY

Opportunity	Location in the supply chain	Social, economic and environmental	
		Advantages	Constraints
Electricity cogeneration	Harwood sugar mill	Extension of benefits already being achieved by cogeneration of electricity at Condong and Broadwater mills	Issues are being addressed successfully
Ethanol from molasses	Ethanol factory could be co-located with sugar mill	Technology exists New source of revenue (diversification)	Disposal of liquid wastes Market demand
Ethanol from bagasse or leaf material	Ethanol factory could be co-located with sugar mill	New source of revenue (diversification)	Technology commercialisation Disposal of liquid wastes Market demand
Carbon trading	Market	Economic and social recognition of broader value of crop	Market demand
New break crops, e.g. oilseeds for biodiesel production	Farm	On-farm income diversification Plants provide a range of benefits to the soil health, depending on species	Infrastructure requirements Technology constraints
New sugar products, other than ethanol and electricity, including gene technology, e.g. bioplastics, biodegradable plastics, detergents, aromatic compounds, therapeutic proteins	Farm, factory, other processors	Creation of further opportunities for product diversification	Technology emerging but not yet commercialised

Collaboration is essential for a sustainable supply chain

Traditionally, sugar has been sold primarily as a bulk commodity, limiting the opportunities for producers to differentiate themselves or engage in targeted marketing. This can constrain their ability to hedge against fluctuating commodity prices, thereby increasing their exposure to price fluctuation. The relative anonymity of the bulk marketplace also inhibits collaboration between supply-chain partners in identifying new opportunities to diversify their operations.¹⁹

Market diversification is vital for reducing the risks of supplying a single commodity such as bulk sugar. Increasingly dispersed supply chains are making it harder for companies and industries to improve efficiency and diversify within their own operations. Therefore, working with other operators beyond company boundaries has become imperative for enhancing brand visibility and assurance, as well as integrating and synchronising activities.

To manage the new market environment effectively, it is imperative for sugar growers to share knowledge and build a more robust collaborative platform with their chain partners. Building trust and establishing a long-term, strategic sense of common purpose is essential if stakeholders at different stages of the chain are to work together developing products and market presence beyond individual capacities.

Mutual recognition of the value of each stakeholder's specialist knowledge and different perspectives provides a foundation for leveraging each other's experience to generate more creative and innovative ways to meet market demand. Retailers, for instance, necessarily have a strong consumer focus and knowledge of purchasing habits, which farmers need to share in order to supply consumer demand. Conversely, farmers' knowledge of the capabilities of their land can aid manufacturers and retailers in planning their own purchasing and marketing programs to maximise turnover efficiency and maintain brand credibility.



Greg Roberts, Woolworths explaining sugar shelving strategies with Greg Messiter and Robert Quirk, NSWSMC

¹⁹ Vorley B (2002). *Food, Inc.: Corporate Concentration from Farm to Consumer*, United Kingdom Food Group, London.



The Sugar Link project has focused on the sustainability initiatives currently under way in the sugar supply chain, and on establishing strategies and indicators for measuring progress towards targets. At the final Sugar Link workshop, participants discussed the major initiatives that the sugar supply could undertake to become more sustainable. Table 6 provides a summary of these initiatives, many of which have been discussed in earlier sections of this report.



TABLE 6 SUSTAINABILITY INITIATIVES IN THE SUGAR SUPPLY CHAIN

Issue	Strategy	Target	Means of verification
Wastewater management	Use treated water from sewerage for cooling at the Codong cogeneration plant	Only use the treated water for cooling purposes	Measure alternative cooling water sources for Codong cogeneration plant
	Reduce river water used for cooling at all mills	Increase water recycling	
	Condensate reused throughout process to reduce waste;	Use closed loop/reticulated water throughout operations.	Monitor inputs Monitor losses
	Discharge treated effluent from ion exchange regeneration to river under licence	Reduce amount of regeneration of ion-exchange columns Redirect effluent for other uses	Reduce regeneration times by factory processes Reduce outflow of treated effluent and impact on licence
Best-practice guidelines for farm management	Develop a monitoring system to survey all farms	Sample audit of growers in each area	Audit report and follow up
	In the 2008 memorandum of agreement, include a requirement for all growers to comply with farming code of practice	100% compliance '10 in 10' program: 50% of all growers on controlled traffic and cover-crop rotation in 10 years	
	Improve soil health/carbon content Cane check groups: 'toolbox meetings' with growers	0.5% increase in sugar content as a result of '10 in 10' 100% of growers educated in best-management practices as they develop	Number of farmers implementing best practices
Cane pads	Redesign cane-pad layout to reduce transport and allow for green harvest	Reduce transportation costs and carbon emissions by 2008	Reduce fuel consumption and distance travelled



TABLE 6 (CONTINUED)

Issue	Strategy	Target	Means of verification
Knowledge of activities across the supply chain is currently limited to a few individuals	Hold four-monthly meetings and cane-check groups to educate grower stakeholders	Raise awareness of each sector of the supply chain across all sectors	Uptake of new systems by growers — audit reports
	Work with major customers to explore logistic supply initiatives	Increase involvement with appropriate personnel	Reduce truck movements and increase utilisation of truck capacities; set minimum-order quantity agreements
	Develop communication strategy (including formal business reviews) for education of chain partners.	New communication materials and new packaging/ website Partner with major retailers to educate consumers at point of sale	Review responses Monitor 'hits' on website Meet sales targets
	Liaise with regulators to develop partnerships for addressing specific issues	Contribute to changes in regulation that lead to better social outcomes	Hold frequent meetings with a range of participants Report supply-chain issues in industry newsletters and presentations at a range of workshops Observe greater parity between social and private costs
Community/consumers have low awareness of the activities of the sugar industry	Develop a communication strategy Hold community workshops to raise awareness about cogeneration of electricity and other industry activities	Improve community acceptance and understanding of the industry Provide information on products and shelf positioning	Monitor number of workshops Monitor number of complaints Monitor number and diversity of community-engagement activities
Increase range of products with increased market value	Introduce new sustainable products	Increase net value of product range	Increase market shares and/or price premiums
	Incorporate new packaging innovations (to reduce waste/influence customers)	Engage consumer support for new products and innovations	Monitor repeat sales
	Increase the breadth of products via investment within category (eg sustainability or organics) Improve point-of-sale differentiation and brand positioning	Increase brand loyalty	Improve preferred status recognition with customers

Verification of product claims

Consumers have a right to make an informed decision when choosing products, and to have access to the information they need to make that decision. The comprehensive benchmarking, measuring, and auditing that the sugar industry is undertaking will provide verification of their good business practices to the market, consumers, the broader community and to the government.

Mandatory food labelling in Australia is governed by Food Standards Australia New Zealand (FSANZ) through the Food Standards Code and enforced by Australian federal, state, territory, and New Zealand legislation. The requirements of the code include food identification, mandatory warning and advisory statements, ingredients, date marking, directions for use and storage, and nutrition information. Labels documenting environmental, social or economic aspects of food products are not mandatory in Australia.

Voluntary third-party labels provide businesses with a framework for verifying compliance through auditing services offered by industry groups, non-profit organisations or private companies. Businesses compliant with the criteria set out by the auditing service become eligible to use the associated label on their product packaging. The Australian Competition and Consumer Commission monitors many voluntary-labelling arrangements and can require that documented verification systems be underpinned by an effective *Trade Practices Act 1974* compliance programme.

Establishing an accredited sustainability standard for a food product would be complex even if limited to the on-farm part of the supply chain because of the widely differing practices of land managers and the variety of Australian environments. While voluntary product declarations could be an option for businesses to make marketable claims about sustainability performance, it would be necessary to be able to verify claims to comply with Australian law such as the *Trade Practices Act 1974*.





Structured communication

Successfully including business and consumer stakeholders in the supply-chain process requires structured and consistent communication. A communication strategy opens new channels of information exchange and ensures that relevant information gets to those who need it. Providing a clear framework also assists in establishing where and when information is best provided, and lets stakeholders know who they can contact when a particular need becomes apparent. By ensuring that personnel in different operations are aware of the interactions between partners, improved communication also improves operational and collaborative effectiveness.

Keeping stakeholders well informed encourages a sense of shared interest in the success of the supply chain. This applies as much to community groups, government officials and the general public as it does to businesses and industry bodies. An inclusive environment can ease transaction processes such as contract negotiations or regulation adjustments, and refocus discussion on ways to 'increase the pie' rather than on dividing it.

Developing a transparent system of public or sustainability reporting creates a positive and informed foundation for ongoing dialogue and builds trust and awareness across differing interests and perspectives. However, the longer and more complex a supply chain becomes, the more difficult it is to maintain communications, which then affects traceability and product verification.



WHERE TO NEXT?

This report has focused on the initiatives currently under way in the sugar supply chain. The Australian Government's Sustainable Industries Initiative, operated through the National Landcare Programme acknowledges that industry cannot endure loss-making strategies, so social and environmental objectives need to be aligned with long-term value building. The programme has provided research and development (R&D) support to enable the sugar supply-chain stakeholders to explore and document their diversification progress away from a reliance on bulk sugar towards biofuels and packaged and branded products. Over the 18 months of the Sugar Link project's research, the stakeholders have acknowledged that there are many challenges ahead:

- » there are some weak links between stakeholders in the chain
- » consumers have limited information about the processes required to produce food
- » farmers receive limited acknowledgment for the ecosystem and societal services that they provide to the broader community
- » coastal regions have a changing demographic requiring ongoing education and engagement with the industries practices.

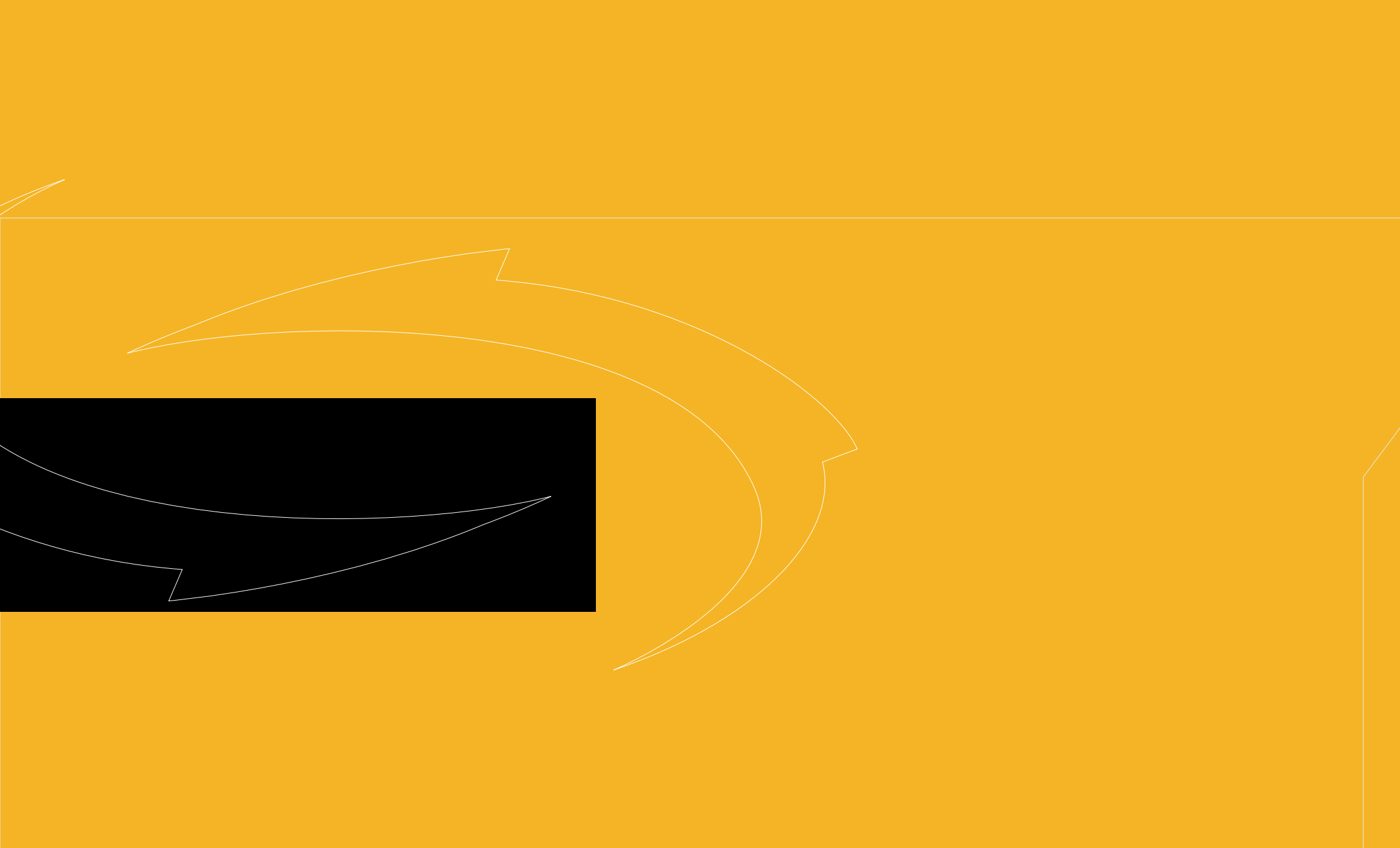
Most challenging is the verification of claims using a range of certification systems in a complex supply chain. Current certification and auditing has a focus on food safety and quality of products and environmental monitoring of farms and factories. Incorporating social standards requires new data, systems and leadership.

The corporate sector is always looking for ways to differentiate its products and services. Price and quality are no longer viable product-differentiation traits in most retail and service sectors. Some consider that being sustainable is the only trait left to market. Fundamentally, being sustainable is about strategy. A sustainability strategy must be strongly aligned to innovation and market opportunities, the values of the leadership, ethical procurement in the supply chain, community partnerships and environmental performance. It is also important to learn about consumer purchasing habits and to communicate widely about what the industry is doing so as to create customer demand for the products.

There are also many benefits from successful collaboration. Market diversification is vital for reducing the risks of supplying a single commodity such as bulk sugar. The discussions during the Sugar Link workshops have shown that successful collaboration can enable market diversification and sustainable development through:

- » working collectively and debating with chain partners about what a sustainable future will look like
- » exploring each stage of the supply chain to raise knowledge and to understand each sector's different demands and perspectives
- » exploring opportunities for product diversification with new sustainable-labelled packaging
- » increasing transparency and enabling verification of products through the entire supply chain
- » communicating success and challenges within the supply chain and externally to consumers and local communities.





The logo for Sunshine Sugar features the words "Sunshine" and "Sugar" stacked vertically in a white, cursive script font. The text is centered within a light gray circular background, which is itself set against a solid black rectangular field.

*Sunshine
Sugar*

