

# Australian Dairy Manufacturing Industry Sustainability Report

2007/08

*Australian dairy  
companies working  
together for a  
sustainable future*

A Dairy Australia report on behalf of the  
Dairy Manufacturers Sustainability Council

# Dairy industry sustainability scorecard

## Economic performance (2007/08)

**3<sup>rd</sup>**  
largest rural industry  
in Australia

**\$6.9 billion**  
economic contribution from  
dairy manufacturing

**11%**  
of international  
dairy trade

**15,675**  
people directly  
employed in dairy  
manufacturing<sup>1</sup>

**\$6 billion**  
in capital assets held by  
dairy manufacturers

**2.5**  
regional economic  
multiplier for every  
dollar invested in the  
dairy industry<sup>2</sup>



## Environmental performance<sup>3</sup>

**26%**  
water consumed is  
recycled (2007/08)

**Half**  
of wastewater is used  
to irrigate local farm land  
(2007/08)

**One-third**  
of solid waste is  
recycled (2007/08)

**440 ML**  
reduction in fresh water  
consumption (2004/05  
– 2007/08)

**550 ML**  
reduction in wastewater  
generation (2004/05  
– 2007/08)

**6,000 t**  
reduction in greenhouse  
gas emissions (2004/05  
– 2007/08)

**880 t**  
reduction in solid waste  
going to landfill (2004/05  
– 2007/08)

**200 t**  
reduction in chemical  
usage (2004/05 – 2007/08)

**35%**  
fewer complaints about  
local site activity (2004/05  
– 2007/08)

## Social performance

A 2007 survey of regional and rural communities across Australia found that the vast majority of people regarded the local dairy industry as:

- important for the social and economic prosperity of rural Australia
- vital to the local economy
- benefiting their local community, and
- providing rural and regional dairy communities with a better quality of life compared with the average Australian.



1. Australian Government, Department of Agriculture Forestry and Fisheries, 2008, Australian Food Statistics 2007.

2. ABARE, Australian farm survey results 2004–05 to 2006–07, AGPS, Canberra, 2007.

3. Absolute volume and tonnage reductions are compiled from the case studies supplied by Australian dairy manufacturers in response to this survey

# Introduction

The *Australian Dairy Industry 2007/08 Sustainability Report* assesses dairy manufacturing's overall environmental performance. It compares the industry's performance during 2007/08 to 2004/05, as set out in the dairy industry's benchmark environmental report, *State of the Environment Report 2005* (SoE). The dairy industry's intention is to assess its environmental performance every three years.

The report assesses the industry's environmental performance according to key performance indicators (KPIs), largely based on the environmental performance criteria established in the SoE report. The KPIs cover the key environmental impacts: energy, water and chemical consumption, greenhouse gas emissions, solid waste production, packaging reduction initiatives and wastewater discharge.

There has been significant change in the dairy industry during the three years between reports. Prolonged drought throughout Australia reduced water availability to many dairy farmers and

manufacturers, leading to reduced raw milk production with flow-on effects in dairy processing efficiencies.

The *Australian Dairy Industry 2007/08 Sustainability Report* was commissioned by Dairy Australia on behalf of the Dairy Manufacturers Sustainability Council (DMSC).

The DMSC includes representatives from the major dairy manufacturing companies. Its primary role is to provide outstanding value across the dairy industry by setting standards for environmental sustainability, influencing the transfer of key skills and knowledge, and guiding research activity.

Dairy Australia is the dairy industry's national service company. The company is owned by the industry, and its members are farmers and industry bodies. On average, Dairy Australia annually invests \$50 million of dairy farmer levy payments and taxpayer funds into research and development and services for the benefit of the Australian dairy industry.

# Foreword



**Mike Ginnivan,**  
Managing  
Director,  
Dairy Australia

The *Australian Dairy Industry 2007/08 Sustainability Report* is a valuable record of the dairy manufacturing sector's performance in environmental management.

This is the second collaboration between dairy manufacturers, led by the Dairy Manufacturers Sustainability Council, to survey their investment in reducing their environmental impact.

Industry participation has grown since the industry produced its 2004/05 benchmark report. Participating manufacturers now account for more than 90% of raw milk processing. They report a combined investment over the past three years of more than \$27 million in new plant, equipment and processes to reduce or better manage their:

- consumption of water, energy and cleaning chemicals;
- generation and treatment of wastewater;
- generation of emissions and solid waste; and
- water recycling and packaging.

The Dairy Manufacturers Sustainability Council is to be commended for creating a vehicle for industry competitors to work together on solving common problems. Despite competing for milk supply and for market share in domestic and overseas markets, these companies are sharing their challenges and successes in environmental management.

Proactive and open collaboration is the hallmark of the dairy industry approach to change and meeting key challenges. Industry members work together to identify and implement responses that are market oriented, resource efficient and socially responsible. Improving dairy manufacturing's environmental management is one such example.

The Australian Government's proposed Carbon Pollution Reduction Scheme poses some unique challenges for the dairy industry, especially if it is implemented in advance of, or differently to, our major competitors. Our industry will need to balance the competing interests of an emissions trading scheme with other national initiatives relating to climate change, food security, innovation and regional development.

The dairy industry broadly supports a comprehensive government and industry response to climate change. As an industry, we have made adapting to climate change a strategic priority. Through Dairy Australia, we are committing millions of dollars to addressing key aspects of adaptation to climate change. We were an early adopter of lifecycle analysis of energy use, and in recent years have undertaken and implemented a wide range of energy efficiency improvements at both farm and factory level.

Dairy Australia has committed to a new national program, *Dairy Sustainability*, to help Australians understand how the dairy industry is operating in a more sustainable way. The program draws together all aspects of dairy to show how farmers, manufacturers and others are balancing the needs of meeting growing consumer demand for dairy products while working towards more sustainable outcomes for the environment, our industry and the broader community.

The 2007/08 Sustainability Report is just one way in which the dairy industry is seizing the initiative to work together on solving common problems so that all dairy manufacturers can maximise their ability to reduce their environmental footprint. I look forward to the next report in 2012.

# Contents

Executive summary .....	6
Dairy in action .....	8
Social contribution .....	4
Nutritional benefits of dairy foods .....	5
Dairy manufacturing.....	5
Survey response .....	12
Analysing environmental performance .....	12
Survey sample .....	12
Factors influencing KPIs.....	12
Key Performance Indicators .....	13
Water .....	14
Energy .....	16
Greenhouse gases.....	19
Packaging .....	21
Solid waste and by-products.....	23
Wastewater .....	25
Chemicals .....	27
Dairy manufacturing environmental management .....	28
Environmental issues.....	28
Government environmental programs.....	28
Management systems .....	29
External programs.....	29
Incidents and complaints.....	30
Future initiatives and reports .....	31
Appendix 1 – Glossary .....	32
Appendix 2 – Weblinks .....	32

# Executive summary

This *Australian Dairy Industry 2007/08 Sustainability Report* clearly demonstrates dairy manufacturing's progress in environmental management since the benchmark survey in 2004/05. Participating manufacturers now represent 91% of milk production in Australia, a 17% increase from the previous study.

Overall, the environmental performance of dairy manufacturing is improving but finely balanced. The survey results show dairy's use of fresh water is declining, with increased recovery of water. The production of wastewater has fallen and close to half the wastewater is used to irrigate farming land. Advances in water recovery and recycling and water treatment have led to an increase in overall energy consumption, but the most energy-intensive sector in the dairy chain – milk powder production – has improved its energy efficiency over the past three years.

Dairy manufacturers have improved their water use efficiency since 2004/05. A 'like-for-like' comparison of manufacturing sites from both surveys showed a 5% fall – from 1.34 to 1.28 L – in fresh water consumption per litre of raw milk processed.

The proportion of recycled water used in dairy processing increased from 15 to 26% of total water consumption. The growth in recycled water use comes from the adoption of reverse osmosis systems to recover water. The volume recovered using reverse osmosis has increased from 5 ML in 2004/05 to 1,858 ML in 2007/08.

A 'like-for-like' comparison of manufacturing sites showed that the generation of wastewater fell from 1.6 to 1.5 L wastewater/L raw milk processed. More importantly, 47% of the 13,900 ML of wastewater generated in 2007/08 is used to irrigate local farm land.

The surveyed dairy manufacturers consumed 10.9 million gigajoules (GJ) of electricity and thermal energy in 2007/08 or 1,319 GJ/ML raw

milk. A site comparison with 2004/05 shows a 12% increase of 114 GJ/ML of raw milk.

Milk powder manufacturing sites account for 72% of the total energy consumed by the dairy manufacturing industry. Since 2004/05, minimum and maximum energy consumption across the powder manufacturing sector fell 2% and 17% respectively. The average energy consumption for these sites dropped 9%, from 1,648 to 1,506 GJ/ML raw milk.

This reduction in energy consumption reflects industry concerns surrounding energy availability and cost. The Australian Government's proposed Carbon Pollution Reduction Scheme, if implemented in its current form, will affect all dairy manufacturers through increased energy costs.

Dairy manufacturing is well positioned to continue to improve its water and energy efficiency in the immediate future. The outlook is very positive if the outcomes detailed in the manufacturer case studies featured throughout this report can be replicated across the industry.

A summary of the investments and savings associated with the case studies indicates a genuine commitment to sustainable improvement in environmental management:

- more than \$27 million invested in projects;
- more than \$2.5 million in savings from these projects;
- savings of more than 6,000 tonnes of greenhouse gases;
- saving of more than 443 ML of water;
- reduction of more than 200 tonnes of chemicals used;
- reduction of more than 550 ML of wastewater production; and
- savings of more than 880 tonnes of waste going to landfill.

# Executive summary

## Key Performance Indicators

### Water

- › Sites surveyed consumed 12,900 ML of fresh water or 1.5 L fresh water/L raw milk processed
- › A comparison of sites surveyed in both 2004/05 and 2007/08 shows a 5% fall in overall fresh water consumption per litre of raw milk processed, from 1.34 L fresh water/L raw milk to 1.28 L fresh water/L raw milk
- › 26% of water consumed (4,600 ML) is recycled water, largely from condensate and membrane permeate, a 56% increase (2,600 ML) on 2004/05 when recycled water was only 17% of water consumed

### Energy

- › Sites surveyed consumed 10.9 million GJ of electricity and thermal energy
- › Site comparison with 2004/05 shows a 114 GJ/ML raw milk increase
- › Milk powder manufacturers became more energy efficient – average energy consumption fell 9%

### Greenhouse gases

- › Total greenhouse gas (GHG) emissions from electricity and thermal energy consumption was estimated at 1,209 kt CO<sub>2</sub>-e (90% representation) or 146 t CO<sub>2</sub>-e / ML raw milk
- › Results compare well with previous industry estimates of 1,365 kt CO<sub>2</sub>-e or 142 t CO<sub>2</sub>-e / ML (95% representation)

### Packaging

- › 88% of surveyed companies are signatories to the National Packaging Covenant – a voluntary scheme to reduce packaging

### Solid waste

- › Industry averages 5.8 tonnes of solid waste / ML of raw milk
- › One-third of waste is recycled

### Wastewater

- › Total sites surveyed generated 13,900 ML of wastewater in 2007/08
- › Site comparison with 2004/05 shows wastewater production fell from 1.6 to 1.5 L wastewater / L raw milk
- › Overall, total industry wastewater generation increased slightly from 1.6 to 1.7 L wastewater / L raw milk
- › Nearly half the wastewater (47%) is used to irrigate local farm land
- › Nearly two-thirds of manufacturers operate wastewater treatment systems

### Chemicals

- › 90% of sites reported using sodium hydroxide and nitric acid for cleaning

# Dairy in action

The dairy industry is Australia's third largest rural industry, after beef and wheat, with a farmgate value in 2007/08 of \$4.6 billion. It is the largest value-added food industry, with ex-factory production valued at \$11.5 billion in that year, delivering a net contribution of \$6.9 billion to the nation's economy.

Australian dairy manufacturers export 725,000 tonnes of product to 110 countries, which generates an estimated \$2.9 billion in export income each year (11% of the international dairy trade). The dairy industry has some \$20 billion in capital assets on-farm and about \$6 billion in manufacturing.

The Australian dairy industry supports a substantial employment base, including:

- farming (supporting or employing 23,000 people);
- services to farming (including veterinary, genetics, animal nutrition, milking machinery, seed and fertiliser, and fodder contracting – an estimated 10,000 people);
- manufacturing (including cheese, yogurt, ice-cream, butter, chocolate, powders, dairy ingredients and pharmaceutical products – estimated at up to 16,000 people);
- transport (from on-farm milk pick-up to container shipping); and
- research (in areas such as agriculture, environment, human nutrition, manufacturing processes and food technology).

(Statistics from Dairy Australia, 2008, Australian Dairy Industry In Focus 2008 and Dairy Australia, 2008, Annual Report 2007/08)

*\* The dairy community averaged 7.53, compared with the 7.1 national Australian average established by Considine and Callus in the Australian Quality of Working Life Index, 2002.*

## Social contribution

In 2007, Dairy Australia commissioned the Queensland University of Technology to undertake a social impact assessment of the Australian dairy industry.

The assessment examined the quality of life, wellbeing and perceived impacts of dairy industry practices on employees and community members of 17 regional and rural communities across Australia. Nearly 3,000 respondents completed the survey, of whom 231 were dairy industry employees.

The majority of the respondents were overwhelmingly positive about the dairy industry. They reported that the dairy industry was:

- important for the social and economic prosperity of rural Australia;
- vital to the local economy;
- benefiting their local community;
- providing rural and regional dairy communities with a better quality of life compared with the average Australian;
- being environmentally responsible, but that management of water use and air quality were key issues for improvement; and
- giving both residents and dairy factory employees high satisfaction with the quality of their working life.

Responses on the Australian Quality of Working Life Index revealed that, on average, employees in rural and regional areas, and in the dairy industry, reported greater satisfaction with their working life than the national Australian average.\*

## Nutritional benefits of dairy foods

Dairy foods are a complex mixture of components that have been used as a food by humans for thousands of years. They are naturally nutrient rich and are associated with the prevention of a range of adverse health conditions.

More than 90% of Australians eat dairy foods. Dairy accounts for about a quarter of total energy intake of 2-3 year olds and more than 10% of total energy intake of all other age groups in the Australian population.

Few other single foods can provide the same energy and nutrient contribution to the daily diet. The complex composition of dairy foods also aids the body's absorption of nutrient and minerals. Studies have shown that calcium from dairy foods is better absorbed than calcium from other dietary sources.

There is increasing scientific evidence to support the health benefits of dairy. Research shows that adequate intake of dairy foods will reduce the threat of bone fracture and osteoporosis, and help in the management of weight and obesity, heart disease (including hypertension), some cancers (particularly colorectal), kidney stones, type 2 diabetes and dental health.

## Dairy manufacturing

Australia's dairy industry has experienced significant pressure over the past three years, with drought and climate change concerns affecting both milk production and water resources. Production dropped 8.9% to 9.2 billion litres over that period. However, dairy remains one of Australia's largest food and export industries, contributing about \$6.9 billion to the nation's economy.

There has been little change in the distribution of dairy manufacturers, with most (80%) manufacturing based in Victoria, Tasmania and South Australia.

The major manufactured product streams are:

- fresh dairy products – drinking milk and other consumer products such as yogurts, custards and dairy desserts;
- cheese – including specialised ingredients such as whey, proteins and nutraceuticals; and
- butter and milk powders – including skim milk powder (SMP), butter milk powder (BMP), wholemilk powder (WMP) and casein.

The proportion of fresh dairy products – drinking milk and 'other' dairy products – has increased slightly since 2004/05. Dairy manufacturers have pursued new and innovative, value-added products such as specialty cheeses and drinking milk with increased nutritional value. These initiatives have allowed manufacturers to stay competitive despite the reduced raw milk production.

In line with international trends, there was a general trend in Australia's product mix towards cheese and WMP production, and away from butter and SMP lines. However, over the past two years, strong commodity prices motivated a significant re-balancing of company product mixes back towards SMP and butter, to take advantage of the higher relative export returns available from these products (Figure 1).

Around 60% of manufactured product (in milk equivalent terms) is exported. This contrasts with drinking milk, where some 96% is consumed in the domestic market.

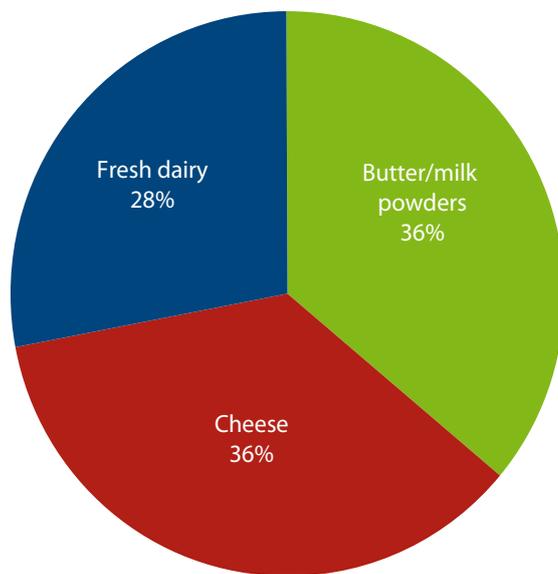


Figure 1: Utilisation of Australian milk, 2007/08.

Dairy manufacturing is a complex business. Three major production processes are used to produce fresh dairy products, cheese and whey, and butter and the range of milk powders (Figure 2 – inside back cover).

The energy intensity of these processes varies considerably. All have fuel costs associated with farm collection and the distribution of finished products but product lines such as milk powder require significantly more energy per tonne to manufacture than other processed products.

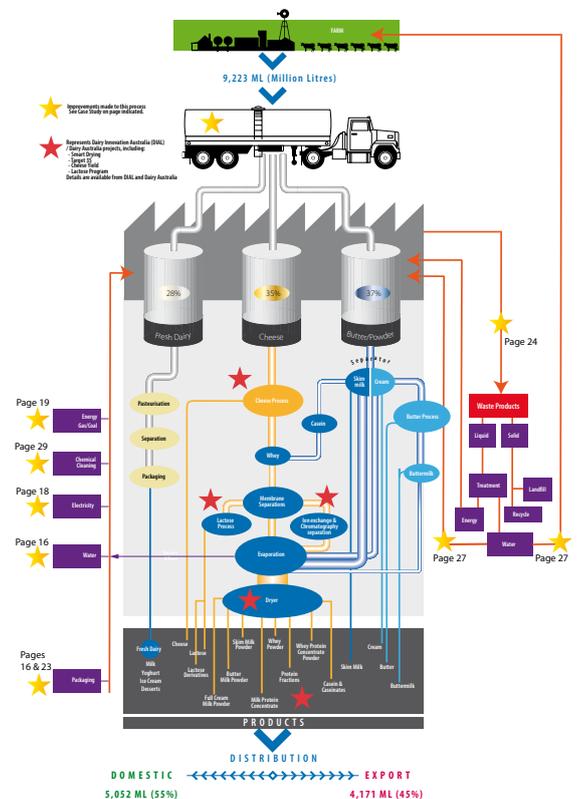


Figure 2: The dairy manufacturing production process – see inside back cover .

# Survey response

## Analysing environmental performance

To evaluate the dairy industry's progress since the first sustainability survey in 2004/05, the new survey analysed two main areas of environmental impact:

- Key performance indicators (KPIs) – water, energy and chemicals consumption, solid waste, wastewater production and packaging usage.
- Environmental practice – environmental management systems, participation in environmental programs, site-specific environmental issues of concern, investment in environmental management and incidents and complaints received.

Respondents were invited to provide case studies on initiatives that had either reduced, or were likely to reduce, environmental impacts.

## Survey sample

The Australian dairy manufacturing sector covers 57 manufacturing sites across 11 companies and co-operatives. In 2007/08, these sites processed 9.2 billion litres\* of raw milk, a fall of 8.9% (900 ML) from 2004/05, largely due to successive droughts.

Of the 57 sites invited to participate in the survey, 52 responded, representing about 91% (8.4 billion litres) of raw milk processed by the industry during 2007/08. This is a 896 ML increase in raw milk and a 17% increase in industry representation from the 2004/05 SoE report.

Despite the substantial improvement in site data collection, not all sites have been able to provide a comprehensive data set. Where information is unavailable for all sites, results are presented with a corresponding percentage representation of total raw milk production.

The survey information and data has been provided in good faith by individual company operations and, where possible, has been cross-checked for accuracy and to ensure it is a true representation of the industry.

\* Dairy Australia, 2008, Australian Dairy Industry In Focus 2008

Table 1: Participating dairy manufacturers and sites.

Single sites	Multiple sites					
<b>Bega Cheese Co-operative</b>	<b><u>Dairy Farmers</u></b>	<b><u>Fonterra</u></b>	<b><u>Murray Goulburn Co-operative</u></b>	<b><u>National Foods</u></b>	<b><u>Norco Foods</u></b>	<b><u>Parmalat</u></b>
	Allansford	Balcatta		Bentley	Labrador	Bendigo
<b>Burra Foods</b>	Baulkham Hills	Cobden	Cobram	Burnie	Lismore	Darwin
	Booval	Cororooke	Edith Creek	Campbellfield	Raleigh	Nambour
<b>Challenge Dairy Co-operative</b>	Canberra	Darnum Park	Kiewa	Chelsea Heights		Rockhampton
	Clarence Gardens	Spreyton	Koroit	Cobden		Rowville
	Hexham	Stanhope	Leitchville	Crestmead		South Brisbane
<b>Tatura Milk Industries</b>	Jervois	Wynyard	Leongatha	Hobart		
	Lidcombe		Maffra	Morwell		
	Malanda		Rochester	Murray Bridge		
<b>Warrnambool Cheese and Butter Factory</b>	Shepparton			Penrith		
	Simpson			Salisbury		
				Timboon		

## Case studies

All dairy manufacturers are involved in implementing projects to improve efficiency, reduce resource use and improve environmental performance while saving money. Dairy manufacturers have provided case studies on specific projects at individual sites that illustrate the investment and gains made in environmental performance.

This report features only a sample of case studies supplied. Table 2 summarises the investment and outcomes of projects detailed in all case studies provided by manufacturers as part of their response to this survey. Table 3 summarises the case studies featured in this report.

**Table 2: Summary of environmental investment by 11 dairy manufacturers (91% industry representation).**

Project category	Investment (\$)	Saving (\$)	Reduction				
			GHG (t)	Water (ML)	Chemicals (t)	Effluent (ML)	Solid waste (t)
Water	\$232,000	\$115,800	–	429	5	414	–
Solid Waste	–	–	–	–	–	–	–
Product Loss	\$71,000	\$375,000	–	3	–	–	–
Packaging	\$25,000	\$24,000	–	–	–	–	888
Liquid Waste	\$23,715,000	\$246,500	–	–	–	172	–
Chemical	\$7,900	\$206,000	–	7	211	–	–
Energy – Electrical	\$127,950	\$515,734	3629	4	1	–	–
Energy Thermal	\$500,000	\$1,030,000	420	–	–	–	–
Greenhouse Gases	\$2,700,000	–	3880	–	–	–	–
<b>Total</b>	<b>\$27,378,850</b>	<b>\$2,513,034</b>	<b>7929</b>	<b>443</b>	<b>216</b>	<b>585</b>	<b>888</b>

**Table 3: Summary of case studies provided by dairy manufacturers.**

KPI	Company/Site	Achievements (annual unless otherwise specified)	Page
Water	Dairy Farmers, Jervois	Savings of 5 ML per year	16
	Tatura Milk Industries	Savings of \$48,000, 51 ML water and 113 ML tradewaste	16
	Murray Goulburn, Koroit	Savings of \$15,000 and 6 ML water	16
Energy	Warrnambool Cheese and Butter	Saving of 550 tonnes CO <sub>2</sub> -e and 420 MWh electricity	18
	National Foods, Bentley	Savings of \$35,000, 470 MWh electricity and 573 tonnes CO <sub>2</sub> -e	18
	National Foods, Penrith	Savings of \$30,160, 377 MWh and 460 tonnes CO <sub>2</sub> -e	18
	National Foods, Morwell	Savings of \$5,000, 117 MWh and 173 tonnes CO <sub>2</sub> -e	18
	National Foods, Burnie	Saving of \$1 million in fuel costs	19
	Dairy Farmers, Canberra	Savings of \$5,800, 417 GJ energy and 29.7 tonnes CO <sub>2</sub> -e	19
	Warrnambool Cheese and Butter	Saving of 420 tonnes CO <sub>2</sub> -e and 7,356 GJ natural gas	19
	Fonterra, Cobden	Saving of \$146,000 and a 5% reduction in natural gas consumption	19
	Murray Goulburn, Maffra	Savings of \$187,814, 190 GWh and 2,318 tonnes CO <sub>2</sub> -e	19
	Greenhouse gas	Warrnambool Cheese and Butter	Introduced biogas fuel system saving 1,600 tonnes CO <sub>2</sub> -e
Murray Goulburn		Converted 80% of transport fleet to Liquefied Natural Gas saving 1,384 tonnes CO <sub>2</sub> -e	21
Packaging	Norco, Raleigh	Saving of \$25,000	22
	National Foods, Hobart	Savings of 3 ML fresh water and 35,000-40,000 cartons	22
	National Foods, Penrith	Recycle up to 95% of cardboard and plastics	23
	National Foods, Campbellfield	Recycle 9 tonnes cardboard per month	23
	Murray Goulburn, Leitchville	Saving of 83 tonnes cardboard	23
Solid waste and by-products	Murray Goulburn, Leitchville	Diverted 110 tonnes of woodchip boiler flyash from landfill to compost	24
Wastewater	Murray Goulburn, Leitchville	245 ML treated factory wastewater and reverse osmosis permeate to local dairy properties	27
Chemicals	Dairy Farmers, Lidcombe	Reduced chemical usage by 40%	28
	Warrnambool Cheese and Butter	Reduced acid sanitiser usage by 30%	28
	Fonterra, Cororooke	Savings of 216 kL water, 4.5 kL chemicals and 225 man hours	28
	National Foods, Bentley	Reduction in weekly CIP washes saving \$120,000 on chemical and water costs	28

# Key Performance Indicators

A range of key performance indicators (Table 4) provides a snapshot of the environmental performance of the Australian dairy manufacturing industry in 2007/08.

**Table 4: Dairy manufacturing key performance indicators (KPI).**

KPI	Application in dairy manufacturing
Water	Water is used for cleaning to ensure the highest levels of food safety and for general processing needs such as heating and cooling.
Energy	Energy is used in refrigeration, air conditioning, machinery operation (pumps, motors, fans, etc), lighting and for general plant running.
Greenhouse gas	Greenhouse gases are emitted during the combustion of fossil fuels for power or steam generation. In dairy manufacturing, the fuels are grid electricity, natural gas, and direct on-site combustion of coal and some wood chips. Greenhouse emissions are reported in tonnes of CO <sub>2</sub> equivalent, using conversion factors from the Department of Climate Change, National Greenhouse Accounts (NGA) Factors, January 2008, and taking into account the source of fuels in each state.
Packaging	Packaging helps maintain the quality of dairy products throughout the supply chain. It also has a role in food safety and damage prevention.
Solid waste and by-products	Dairy manufacturers generate both organic and non-organic wastes. The majority of non-organic wastes are generated through product packaging and maintenance and generally consist of plastics, metals, cardboard, wood and paper, much of which can be recycled. Organic wastes come from a number of different sources such as reject dairy product or wastewater treatment sludge. The majority of organic wastes have the potential to be reused as compost or as a feedstock for animals.
Wastewater	Dairy factories produce wastewater from cleaning and flushing of processing equipment. The wastewater generally consists of product residue, cleaning and waste treatment chemicals and may be high in fat and salt. Methods of waste treatment include dissolved air flotation (DAF) and biological treatment such as aerobic and anaerobic digestion. Many factories discharge directly to sewer or land with minimal treatment. The discharge of all wastewater is closely monitored and regulated under EPA or local water authority tradewaste agreements.
Chemicals	Dairy manufacturers use a wide range of chemicals for water and wastewater treatment, maintaining boilers and cooling towers and cleaning processing equipment. The most commonly used cleaning chemicals are sodium hydroxide (caustic soda), sodium hypochlorite, nitric acid and phosphoric acid.

## Factors influencing KPIs

The quantity of raw milk processed has implications for environmental performance. Large manufacturers are able to achieve efficiencies of scale unachievable by smaller manufacturers. Large manufacturers can often run longer shifts, reducing the amount of cleaning required for the amount of raw milk processed. Participation in this survey by smaller dairy manufacturers has more than doubled since the 2004/05 SoE report (Table 5).

**Table 5: Size of manufacturers.**

Raw milk intake	2004/05 site participation	2007/08 site participation	Change
0 – 50 ML	7	18	+11
50 – 100 ML	4	12	+8
100 – 200 ML	9	7	-2
200 – 300 ML	6	5	-1
300 + ML	7	10	+3

Incorporating a larger number of smaller manufacturers has resulted in a number of the KPIs increasing. Where possible, a site-by-site comparison of the sites that took part in both surveys has been provided as a measure of underlying industry performance.

# Water

- › Sites surveyed consumed 12,900 ML of fresh water or 1.5 L fresh water/L raw milk processed
- › A comparison of sites surveyed in both 2004/05 and 2007/08 shows a 5% fall in overall fresh water consumption per litre of raw milk processed, from 1.34 L fresh water/L raw milk to 1.28 L fresh water/L raw milk
- › 26% of water consumed (4,600 ML) is recycled water, largely from condensate and membrane permeate, a 56% increase (2,600 ML) on 2004/05 when recycled water was only 17% of water consumed

## Water consumption

In 2007/08, the Australian dairy manufacturing industry consumed 12,900 ML fresh water (91% representation of total milk production processing) representing around 0.07% of Australia's total water consumption.\*

Water use across the industry has increased slightly from 1.3 to 1.5 L fresh water/L raw milk due to the fall in the volume of raw milk processed. This increase in water use also incorporates twice the number of smaller manufacturers processing less than 50 ML of raw milk. The site comparison with 2004/05 shows a 5% fall in overall fresh water consumption per litre of raw milk processed from 1.34 to 1.28 L fresh water/L raw milk (Figure 3). More than 84% of water comes from mains water (town supply).

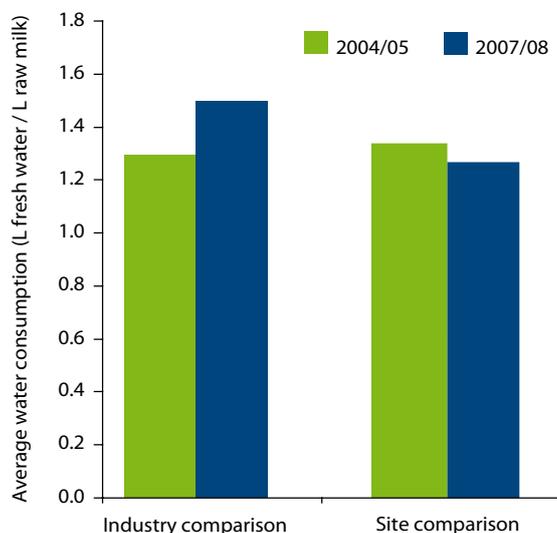


Figure 3: Change in water consumption.

## Water recycling

Since 2004/05, dairy manufacturers have pursued a range of water recycling and reuse opportunities. The quantity of water recycled within the industry is estimated at about 4,600 ML. Figure 4 shows the different sources of recycled water.

The amount of recycled condensate (cow water) produced during milk evaporation for powder production has increased by 10% since 2004/05; almost one-quarter of sites surveyed recovered condensate water bringing the total recovered to more than 2,200 ML.

The amount of recycled water from reverse osmosis (RO) systems increased from about 5 ML to more than 1,858 ML. This has had corresponding impacts on energy consumption highlighting the delicate balance between competing resources.

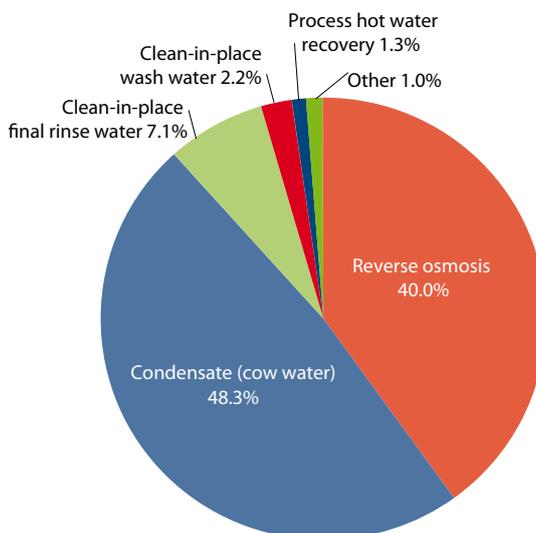


Figure 4: Sources of recycled water.

\* Trewin, D, 2006, Water Account Australia 2004/05, Australian Bureau of Statistics.

## Manufacturing consumption rates

Different manufacturing processes consume varying quantities of water. Figure 5 shows that milk powder-producing factories consume significantly less water than cheese producers.

Although there was a slight increase in total water use per litre of raw milk processed, it is clear from the case studies that there has been significant focus on improving water use efficiency and reducing overall water consumption. The increase in average water consumption can be attributed to reduced raw milk intake, to increased representation of smaller, less-efficient manufacturers and to diversification of products.

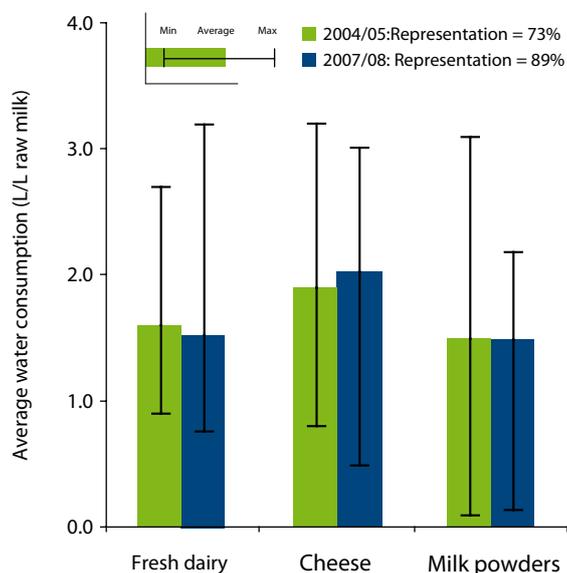


Figure 5: Fresh water use by manufacturing type.

## Water

**Dairy Farmers Jervois** reclaimed vacuum pump seal water into the pre-treatment raw water storage saving 5 ML a year. The pump and pipework cost \$1,000 to install and paid for itself within three months.

**Tatura Milk Industries** spent \$98,000 to reuse pump seal water, saving \$48,000 and 51 ML of water per year. Other initiatives reduced tradewaste by 113 ML a year.

**Murray Goulburn Koroit** increased the volume of its CIP recycle tanks capturing caustic soda and water, which was previously overflowing into the wastewater system. It saves about \$15,000 in chemicals per year and has reduced water consumption by 6 ML.

# Energy

- › Sites surveyed consumed 10.9 million GJ of electricity and thermal energy
- › Site comparison with 2004/05 shows a 114 GJ/ML raw milk increase
- › Milk powder manufacturers became more energy efficient – average energy consumption fell 9%

## Energy consumption

The total annual quantity of electrical and thermal energy consumed by respondents of the survey was estimated at 10.9 million GJ (90% representation). This equates to about 1,319 GJ/ML raw milk, an increase of 231 GJ/ML on 2004/05 data (Figure 6).

The site comparison with 2004/05 shows a slight increase of 114 GJ/ML raw milk. The increase is attributable to the increase in milk powder production, which is more energy-intensive than the production of fresh dairy products, butter and cheese.

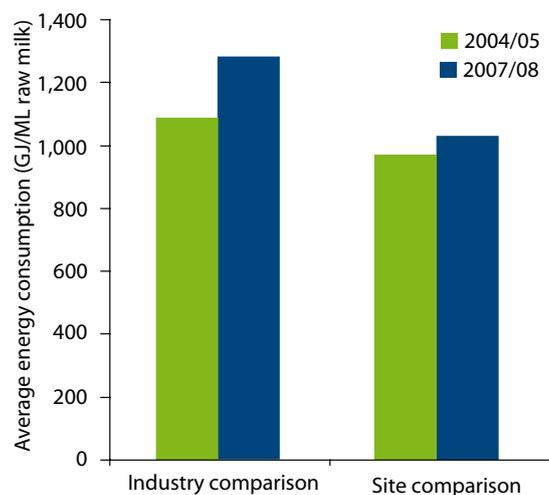


Figure 6: Changes in energy consumption.

## Sources of energy

Manufacturers use a number of different sources of energy depending on the required application. Natural gas and grid electricity were the two main sources of energy reported by dairy manufacturers (Figure 7).

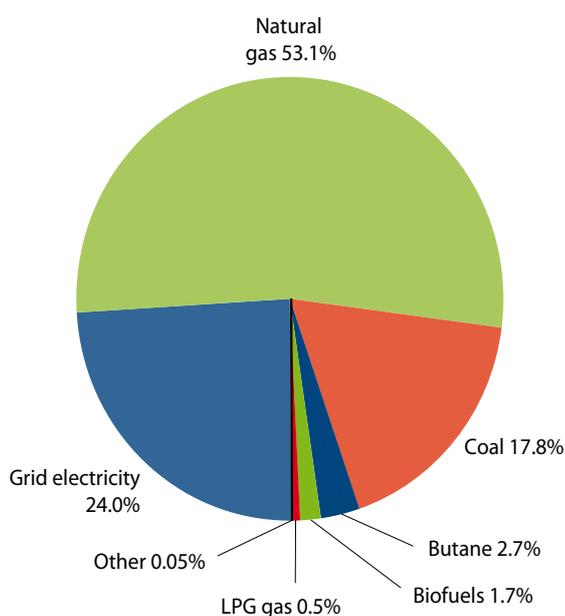


Figure 7: Sources of energy.

## Energy requirements of dairy manufacturers

Energy requirements for dairy manufacturers vary depending on the type of products being produced. Compared to producing drinking milk, milk powder manufacturing consumes more energy (Figure 8) because the process of evaporating water from milk to produce milk solids and powders requires larger energy expenditure.

Milk powder manufacturing represents the majority (72%) of the total energy consumed by the dairy manufacturing industry (Figure 9). However, since 2004/05, milk powder manufacturing has become more energy efficient. Minimum and maximum energy consumption across the powder manufacturing industry fell 2% and 17%, respectively, while the average energy consumption for powder sites dropped 9%, from 1,648 to 1,506 GJ/ML of raw milk processed. The reduction in energy consumption observed across milk powder manufacturing reflects industry concerns surrounding energy availability and cost.

The increase in representation by smaller manufacturers since the 2004/05 SoE report has resulted in an increase in maximum and average

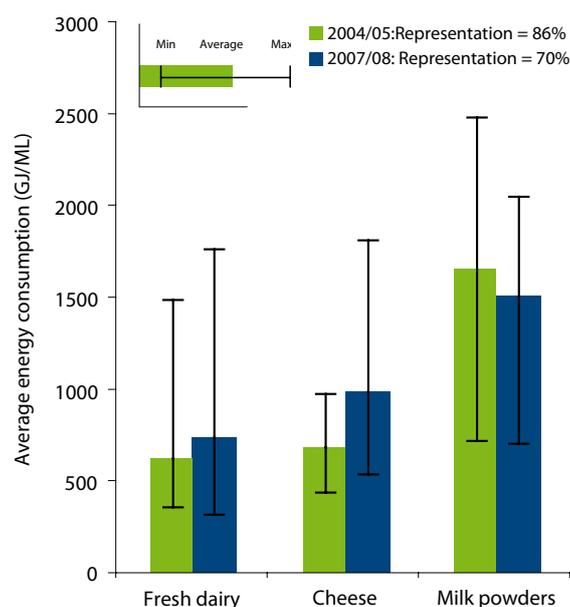


Figure 8: Energy consumption by manufacturing type.

energy consumption per litre of raw milk for fresh dairy products and cheese manufacturing. Smaller manufacturers are generally not able to achieve the efficiencies of production attained by larger manufacturers.

Manufacturers have also installed and upgraded wastewater treatment systems to reduce potential environmental impacts from wastewater discharge and installed water recycling processes to reduce

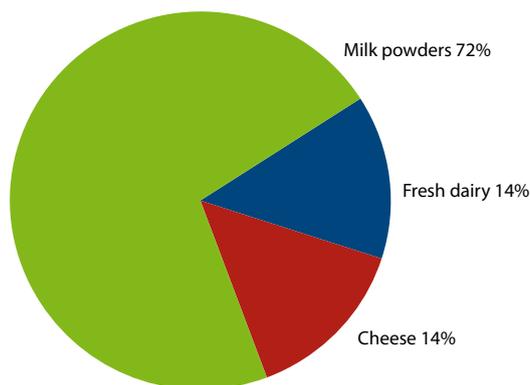
## Electrical Energy

**Warrnambool Cheese and Butter Factory** reduced electricity consumption by undertaking an audit of its compressed air system and repairing leaks. This is a saving of 420 MWh of electricity per year or 550 tonnes CO<sub>2</sub>-e per year.

A new air compressor and condensate recovery system saves **National Foods Bentley** about 470 MWh and \$35,000 a year in electricity and recovered heat. At a cost of \$27,400, this project paid for itself in less than 10 months and saves about 573 tonnes of GHG emissions per year.

**National Foods Penrith** monitors the electrical energy use for each processing section, which allows it to investigate any wastage. It was able to reprogram the chillers to make them operate more efficiently, saving 377 MWh (460 tonnes CO<sub>2</sub>-e and \$30,160) per year. The monitoring equipment cost \$14,000 to install and paid for itself in six months.

A new air compressor at **National Foods Morwell** saves 117,600 kWh per year as the variable speed drive allows it to respond to changes in demand depending on the needs of the factory. This saved National Foods \$5,000 and reduced CO<sub>2</sub> emissions by 173 tonnes per year.



**Figure 9: Proportion of total industry energy consumption by manufacturing type.**

fresh water consumption. However, by taking on these responsibilities, manufacturers have increased energy consumption from operation of energy-intensive wastewater treatment and recycling systems, especially membrane treatment systems.

More accurate and comprehensive data collection since the original 2004/05 survey may also have influenced outcomes of the analysis along with changes to product lines and the introduction of more energy intensive products.

Energy is also consumed in the transport of raw milk to the manufacturing sites. Generally this is carried out through separate contractors. From information provided by sites, an average of 223 GJ/ML of raw milk is required for transport of milk to site (60% representation) using diesel (99.9%).

In the past year, many manufactures have signed up to voluntary and mandatory government programs to investigate energy use and implement energy-saving initiatives. Some manufacturers have already implemented energy-saving projects and the case studies provided demonstrate the focus dairy companies have on improving energy performance.

It is anticipated that dairy manufacturers, particularly milk powder manufacturers, will continue to significantly reduce their energy consumption as efficiency projects become more cost effective.

## Thermal Energy

**National Foods Burnie** converted its boiler from fuel oil to more efficient natural gas in a project that had a six-month payback period. Each year, it saves about \$1 million in fuel costs.

**Dairy Farmers (CCFA)** at Canberra replaced a number of inefficient steam traps and improved maintenance, saving more than 417 GJ of energy or 29.7 tonnes of GHG emissions and \$5,800 per year. It also achieved a reduction of 324 GJ of energy, 74.3 tonnes of CO<sub>2</sub>-e and \$9,250 per year by ceasing to double pasteurise a portion of the milk stream.

**Warrnambool Cheese and Butter Factory** replaced an inefficient gas flow control valve with a linear valve and reduced gas consumption by 4%, saving about 420 tonnes of GHG emissions and 7356 GJ of natural gas per year. This has had a pay back period of less than two years.

**Fonterra Cobden** found that, over a shift, there was an increasing proportion of gas in the gas/air mixture in the indirect gas-fired air heater in one of its powder plants. This was reducing both efficiency and throughput. A burner controller was installed, which adjusted the mixture to burn more efficiently, allowing the throughput in the plant to increase from 10 to 12 tonnes/hour. Costing \$27,000 to install, it saves the company about \$146,000 per year, reduces gas consumption by about 5% and so also reduces carbon emissions.

**Murray Goulburn Maffra** has installed a heat exchanger to use chilled milk to reduce the chilled water load. This project has saved 1.9 GWh or \$187,814 of electricity per year, which equates to 2,318 tonnes of GHG emissions.

# Greenhouse gases

- › Total greenhouse gas (GHG) emissions from electricity and thermal energy consumption was estimated at 1,209 kt CO<sub>2</sub>-e (90% representation) or 146 t CO<sub>2</sub>-e / ML raw milk
- › Results compare well with previous industry estimates of 1,365 kt CO<sub>2</sub>-e or 142 t CO<sub>2</sub>-e / ML (95% representation)

In early 2008, Dairy Australia commissioned the UNEP Working Group for Cleaner Production at The University of Queensland to complete a GHG inventory for the dairy manufacturing industry. This was developed to help inform the dairy industry of the potential impact of a Carbon Pollution Reduction Scheme (CPRS). The assessment covered dairy farm and manufacturing GHG impacts with the exclusion of transport between the farm and factory.

The National Inventory Report, revised in February 2008, estimated the GHG emissions of Australia in 2005 were about 555.3 Mt CO<sub>2</sub>-e (megatonnes of carbon dioxide equivalent). The Dairy Australia study indicated the total GHG emissions generated from the Australian dairy industry is estimated to be 10.6Mt CO<sub>2</sub>-e (Scope 1 and 2\*) or 8.9 Mt CO<sub>2</sub>-e (Scope 1) for 2006/07 representing 1.6% of Australia's total GHG emissions. As shown in Figure 10, the majority of emissions are generated during farming activities.

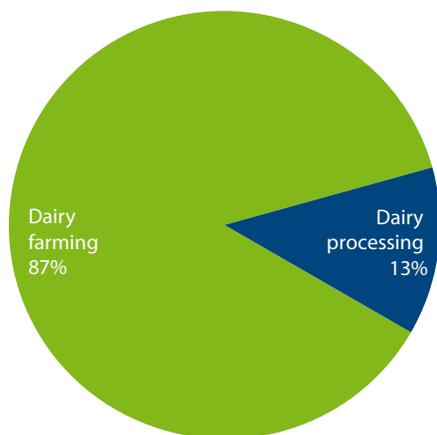
\* Scope 1 emissions are direct emissions from dairy farming and manufacturing. Scope 2 emissions are indirect emissions, e.g. from the use of purchased electricity.

The assessment highlighted that a CPRS could potentially increase operational costs and reduce future revenue streams through:

- increased electricity and other energy costs;
- direct involvement of manufacturers with emissions above the threshold limits; and
- increased transportation, chemical and feedstock costs.

The industry is engaged in a range of emission reduction initiatives such as investment in research to improve manufacturing and farming practices, tree planting on farms for carbon sequestration, and implementation of energy efficiency projects. Large manufacturers are participating in the Australian Government's Energy Efficiency Opportunities program.

Scope 1 and 2 emissions



Scope 1 emissions only

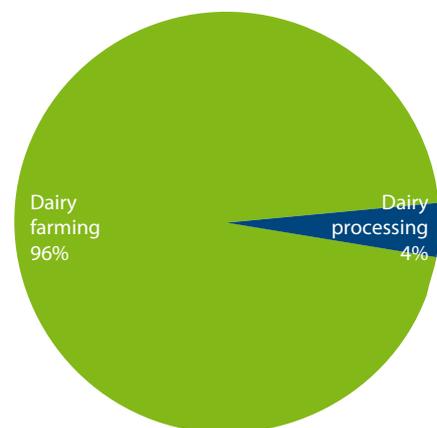


Figure 10: Distribution of GHG emissions.

## GHG emissions

The 2007/08 data collected by this survey was used to update the data for dairy manufacturing. The total GHG emissions from electricity and thermal energy consumption were estimated at 1,209 kt CO<sub>2</sub>-e (90% representation). This equates to 146 t CO<sub>2</sub>-e/ML for manufacturing. These results compare well with previous industry estimates (1,365 kt CO<sub>2</sub>-e or 142 t CO<sub>2</sub>-e/ML for 95% representation).\*

Electricity use creates the highest proportion of total industry GHG emissions (Figure 11), despite a lower overall contribution to industry energy requirements than natural gas (Figure 7). This is because the majority of grid electricity is sourced from high emission coal-fired power stations.

Combustion of fuels during the transport of raw milk to site and onsite forklift usage also contribute to total industry GHG emissions. Transport fuel use contributed about 86 kt CO<sub>2</sub>-e through predominantly diesel-powered

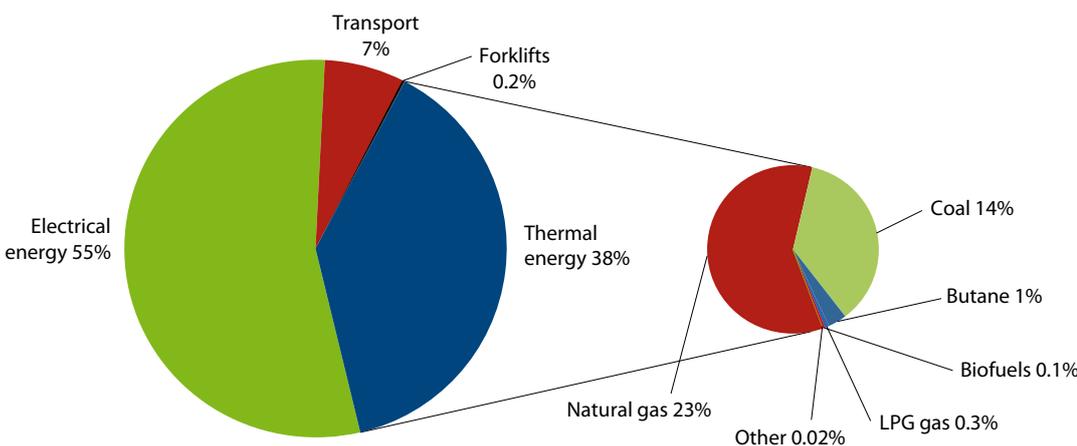
## Energy recovery from waste stream

**Warrnambool Cheese and Butter** replaced a natural gas hot water heater at the treatment plant with a dual fuel system to take advantage of biogas produced from the anaerobic wastewater treatment plant. Biogas (instead of natural gas) is now used in two hot water heaters, saving about 1,600 tonnes of GHG emissions per year.

vehicles (60% representation), or 16 t CO<sub>2</sub>-e / ML raw milk. Forklift fuel consumption contributed an additional 3 kt CO<sub>2</sub>-e to total industry GHG emissions (76% representation) adding 0.4 t CO<sub>2</sub>-e / ML of raw milk.

GHG emissions from electrical energy, thermal energy, transport and forklift use was estimated at about 162 t CO<sub>2</sub>-e / ML of raw milk processed. It should be noted these results are based on available data with representation varying from 60 to 90% of processed raw milk.

*\* Dairy Australia, Greenhouse Gas Inventory for the Australian Dairy Industry, 2006/07.*



**Figure 11. Energy source contribution to GHG emissions.**

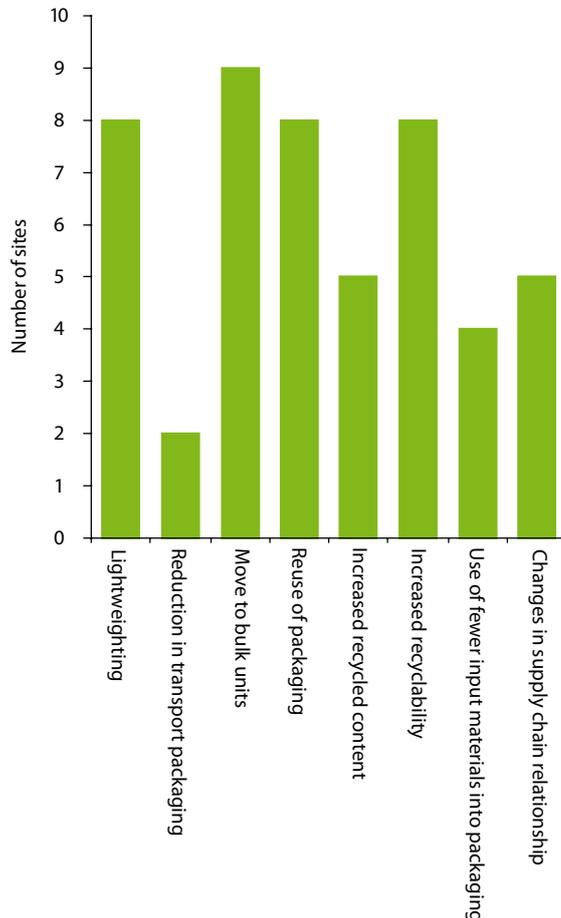
## Transport

**Murray Goulburn** has converted a significant proportion of its 150 strong fleet of prime movers to Liquefied Natural Gas (LNG). At a cost of \$2.7 million, 54 prime movers have been converted, reducing diesel consumption by about 80% on converted vehicles. Progressively, the whole fleet will be converted to LNG with an anticipated saving of 1,730 tonnes of CO<sub>2</sub>-e/year. This is equivalent to taking 433 cars off the road. In addition, the conversion of the engines to LNG reduces nitrous oxide, sulphur dioxide and particulate emissions, as well as noise emissions.

# Packaging

- › 88% of surveyed companies are signatories to the National Packaging Covenant – a voluntary scheme to reduce packaging

Figure 12: Proportion of sites aware of packaging reduction initiatives.



The design and supply of packaging materials tends to be handled on a company-wide basis with individual sites having little influence. Twenty-one sites, representing 55% of milk production had packaging reduction initiatives in use at their site. Figure 12 summarises results of the site survey responses.

From the limited data available, the most successful initiatives appeared to be moving to bulk units for packaging and changes in supply chain relationships.

## Packaging process improvement

**Norco Foods Raleigh** saves \$25,000 per year by implementing a minor program change to the product fillers. This change flushes pasteurised water through cleaned product lines prior to production and reduces losses during product change over.

**National Foods Hobart** made alterations to their carton packer to reduce losses. These included:

- Closing the loop on the cooling water of the top press and guide rails instead of the once pass system saves about 3 ML of town water per year.
- Relocating the vacuum pump to reduce pipework and improve suction, thereby reducing the number of mis-picks by about 50 per day. For every mis-pick, three cartons were removed. Over a year, this saves about 35,000-40,000 cartons.
- Adjusting the magazine carts to allow them to be individually tuned to maximise performance. This provided a noticeable decrease in miss picked cartons.
- Adjusting the filler guides to perform more accurately, reduced the number of damaged cartons per day.

Eight of the 11 companies (88% representation) who responded to the survey are signatories to the National Packaging Covenant (NPC). The voluntary NPC program assists companies to reduce waste production and resource consumption from packaging. The NPC annual reports are a good indication of industry packaging reduction initiatives. Some of the most recently released key results in the 2006/07 NPC reports have been summarised in Figure 13.

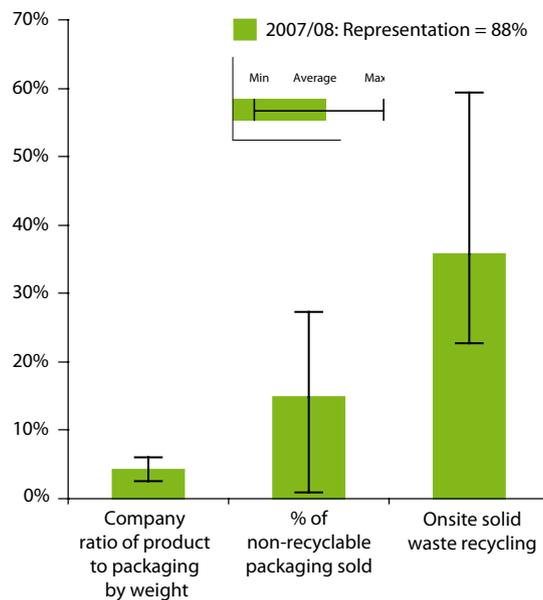


Figure 13: NPC report summary.

## Packaging improvements

**National Foods Salisbury** installed a shredder that removed liquid from plastic and cardboard. The waste disposal company now accepts this cleaner waste for recycling instead of landfill. The **Penrith** site installed a bailer, which compacts its cardboard and a bottle crusher to compact plastic waste allowing the site to recycle 95% of its waste cardboard and plastics. Similarly, the **Campbellfield** site recycles 9 tonnes of cardboard per month since installing a compactor and tippler bin hoist. Costing \$25,000, it paid for itself in just over a year through reduced landfill charges.

**Murray Goulburn (MG) Leitchville** uses a carton-less cheese packing process, saving 83 tonnes of cardboard per year. The cheese blocks are transferred into stainless steel hoops to cool, improving their shape and reducing off-cuts during the natural cut process. Depending on customer requirements, these blocks are packaged into either cardboard cartons or bulk bins, or placed directly onto pallets as un-cartoned blocks. As the customer does not have to de-carton the blocks, it helps MG reach its targets of reduced packaging and improves manual handling. MG saves another 4 tonnes of cardboard a year by changing the Cryovac cheese bag packaging from cardboard to shrink wrap. This reduces the weight of the packaging and the labour time required to transfer cheese bags out of the cardboard and into plastic containers before entering the production area.

# Solid waste and by-products

- › Industry averages 5.8 tonnes of solid waste / ML of raw milk
- › One-third of waste is recycled

## Waste production

Survey respondents in the original SoE report were unable to provide consistent and accurate data on solid waste. Manufacturers have made significant improvements in the quantity and quality of solid waste data collection since then. A number have been working closely with waste service providers in an attempt to better understand the quantities and types of waste being generated.

Solid waste generated by the dairy manufacturing industry averaged 5.8 t of solid waste/ML of raw milk (68% representation).

## Recycled waste

One-third of wastes generated by dairy manufacturers were either recycled or reused, with the rest going to landfill. Most (64%) recycled waste was cardboard and paper, which is collected by waste recycling contractors for offsite recycling (Figure 14).

More than 97% of waste going to landfill was classified as general or mixed waste. The composition of general or mixed waste streams is not recorded by most manufacturers as available waste services vary across the country. Depending on the availability of recycling collection services, the general waste streams can contain significant quantities of potentially recyclable or reusable materials such as plastics, metals, cardboard and paper.

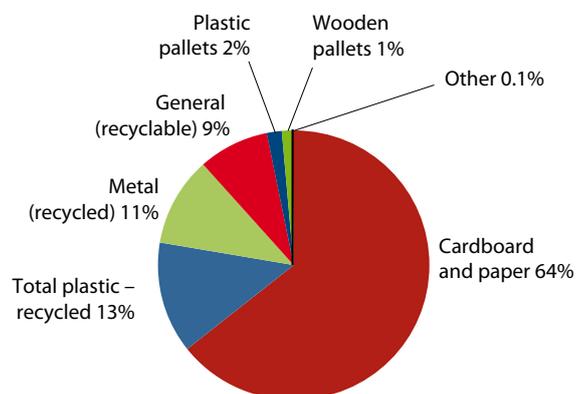


Figure 14: Breakdown of recycled material components of solid waste.

## Recycling to reduce landfill

**Murray Goulburn Leitchville** diverted about 110 t of woodchip boiler flyash from landfill to compost. While there were high costs to improve storage and movement of flyash to the composter, increases in landfill charges and more stringent regulations on landfill made the option viable. The **Leongatha** site combines environmental benefits with social benefits by working with a local special needs school to shred waste paper from the factory office which is then converted into briquettes offsite. These briquettes are sold to raise funds for the school and reduce waste sent to landfill.

## Variations in solid waste production

Sites vary significantly in the quantities and types of solid waste generated. Some sites produce more than 50 times the solid waste per litre of raw milk processed (Figure 15 and Figure 16), which is reflected in the large variation between maximum and minimum values recorded across all manufacturing types and sizes.

Powder manufacturing sites produce (on average) less than half the solid waste per litre of raw milk processed (Figure 15). This could be due to fewer types of products being manufactured, less need for changeovers and cleaning, and more attention to high volume efficiency.

Larger manufacturers are able to achieve, on average, greater efficiencies of scale in terms of solid waste produced per litre of raw milk as evident in Figure 16. Manufacturing sites processing more than 200 ML raw milk produce, on average, less than half the waste per litre of raw milk of smaller specialty manufacturers.

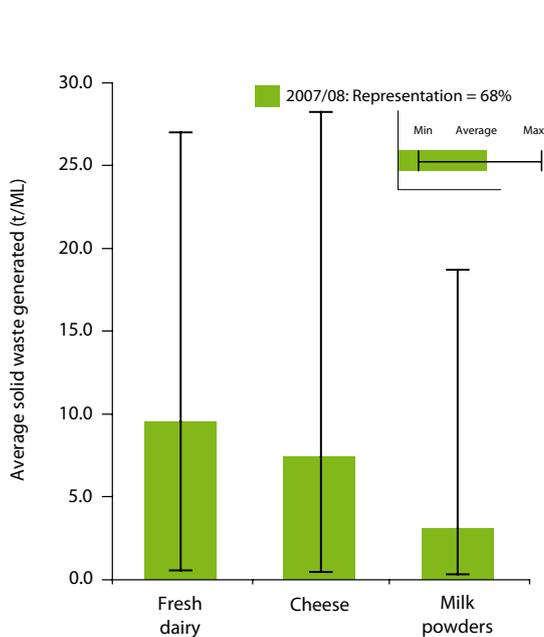


Figure 15: Solid waste produced by manufacturing type.

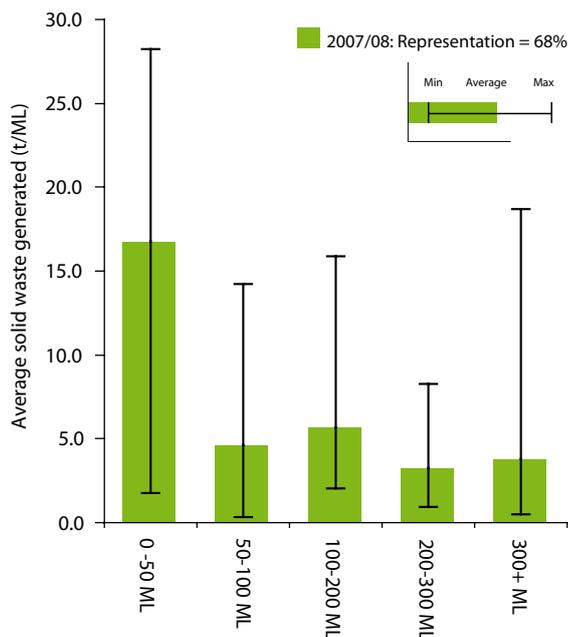


Figure 16: Solid waste produced by manufacturing size.

# Wastewater

- › Total sites surveyed generated 13,900 ML of wastewater in 2007/08
- › Site comparison with 2004/05 shows wastewater production fell from 1.6 to 1.5 L wastewater/L raw milk
- › Overall, total industry wastewater generation increased slightly from 1.6 to 1.7 L wastewater/L raw milk
- › Nearly half of the wastewater (47%) is used to irrigate local farm land
- › Nearly two-thirds of manufacturers operate wastewater treatment systems

The sites surveyed generated more than 13,900 ML wastewater (89% representation), equating to about 1.7 L wastewater/L raw milk processed. This is a slight increase (0.1 L) in total industry wastewater generated from 2004/05 figures. However, the increase in representation has captured a number of smaller, less-efficient sites. Comparing the same sites from both surveys, the average wastewater load decreased by 0.1 L wastewater/L raw milk. This reflects the increased recovery of water from reverse osmosis and condensate across the industry.

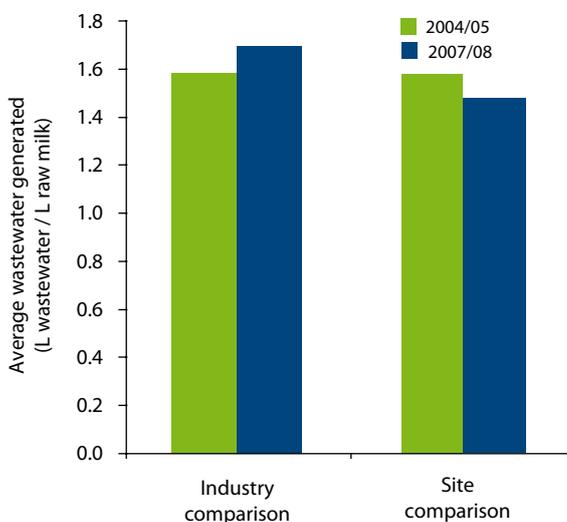


Figure 17: Change in wastewater generation.

## Wastewater disposal methods

The availability of suitable infrastructure typically dictates wastewater treatment and disposal options available to dairy manufacturers. A range of onsite and offsite treatment and disposal methods are used. Irrigation remains the most popular method of final wastewater usage and disposal (Figure 18) and often replaces the need to extract fresh water from water sources such as rivers and dams.

Although it appears that wastewater disposed of to sewer (referred to as tradewaste) has increased in comparison to the SoE report, this is due to the analysis incorporating a greater number of smaller manufacturers. Wastewater treatment systems require significant capital, operational and maintenance expenditure and resources, which is typically not practical for smaller operations with access to local tradewaste operators and wastewater treatment infrastructure.

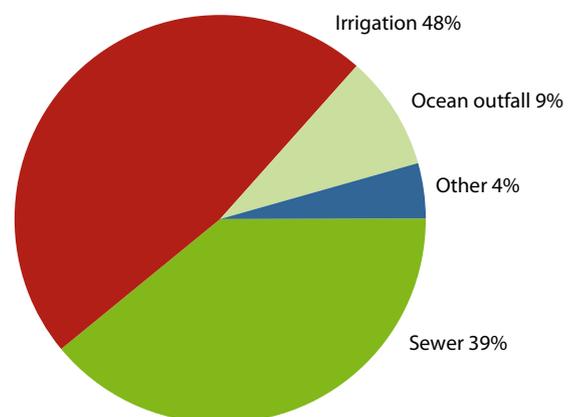


Figure 18: Wastewater disposal methods.

Many dairy manufacturing sites have been proactive in trying to reduce impacts from wastewater. More than 63% of sites – representing 72% of processed raw milk – indicated that they operated wastewater treatment systems. Typical treatment systems include: dissolved and induced air flotation (DAF and IAF), biological treatment (anaerobic and aerobic), physical separation, and chemical adjustment. Sites tend to use a combination of these processes. Figure 19 depicts the main wastewater treatment processes in operation and shows a substantial increase in IAF/DAF and biological treatment systems.

The Closing the Loop project has made significant contributions to improving wastewater performance of the dairy industry. The project (2003-07) was a joint initiative between research providers and dairy manufacturers that developed new practice and technologies with an aim to reduce the volume and cost of waste disposal and to build land-based water reuse systems and regional options for waste treatment and reuse. The research into recovering valuable resources

from wastes for utilisation within dairy processing streams has the potential to reduce wastewater quantities and pollutant loads, reduce resource consumption and provide potentially valuable by-products. Wastewater recycling and reuse systems have also contributed to reducing wastewater loads and improving environmental performance.

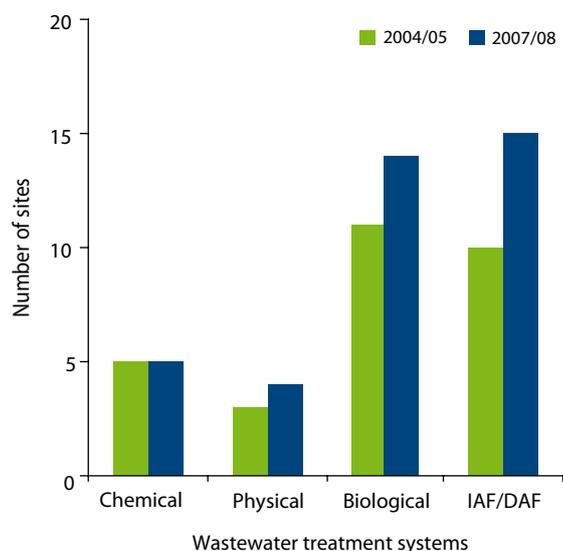


Figure 19: Wastewater treatment systems.

## Water to irrigation

**Murray Goulburn Leitchville** delivers about 245 ML a year of treated factory wastewater and reverse osmosis permeate to dairy properties. This scheme prevents overloading of Murray Goulburn irrigation land and provides farmers with water fortified with nutrients such as nitrogen, phosphorus and potassium, which reduces the amount of commercial fertilisers needed.

# Chemicals

› 90% of sites reported using sodium hydroxide and nitric acid for cleaning

More than 90% of sites reported using both sodium hydroxide and nitric acid. Reduced chemical use has been recorded for nitric and phosphoric acid while sodium hydroxide, sodium hypochlorite and sulphuric acid use have all increased on average.

However, few conclusions can be drawn with certainty from these findings. Some manufacturers were unsure of how to correctly report chemical usage, while a number of sites were unable to report all of their chemical consumption.

**Table 6: Number of sites reporting chemical use.**

Chemical	2004/05 (tonnes)	2007/08 (tonnes)
Sodium hydroxide (NaOH)	20	40
Nitric acid (HNO <sub>3</sub> )	24	37
Sodium hypochlorite (NaOCl)	16	26
Phosphoric acid (H <sub>3</sub> PO <sub>4</sub> )	16	21
Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> )	11	19

## Chemical Cleaning

**Dairy Farmers Lidcombe** improved its cleaning systems, reducing chemical and water consumption, and wastewater generation. Chemical dilution in the packaging hall was previously done manually with frequent overuse of chemicals. Installation of automated chemical dilution units provided controlled dosing of chemicals to maintain quality while reducing chemical usage by 40%.

**Warrnambool Cheese and Butter** reduced equipment sanitising time by 10 minutes per wash cycle on cheese manufacturing equipment. This reduced acid sanitiser usage by 30%. WCB improved the CIP filtering system so that the acid sanitiser could be used in various areas of the cheese manufacturing plant. This saved about \$20,000 per year in chemical costs.

**Fonterra Cororooke** has replaced two small washing troughs with one large trough allowing staff to wash their equipment in one cycle rather than four. This has reduced annual water use by 216 kL, reduced annual chemical use by 4.5 kL and saved staff about 225 hour a year.

Rescheduling of production at **National Foods Bentley** allowed a reduction in the number of weekly CIP washes. This resulted in savings of around \$120,000 per year in chemical and water costs.

Other factors influencing the results of chemical consumption include changes to production volumes, product lines and cleaning regimes. At a number of sites, reduced water use has increased the amount of chemical used for cleaning. Some sites have installed wastewater treatment systems which require intensive cleaning and maintenance procedures which consume additional chemicals.

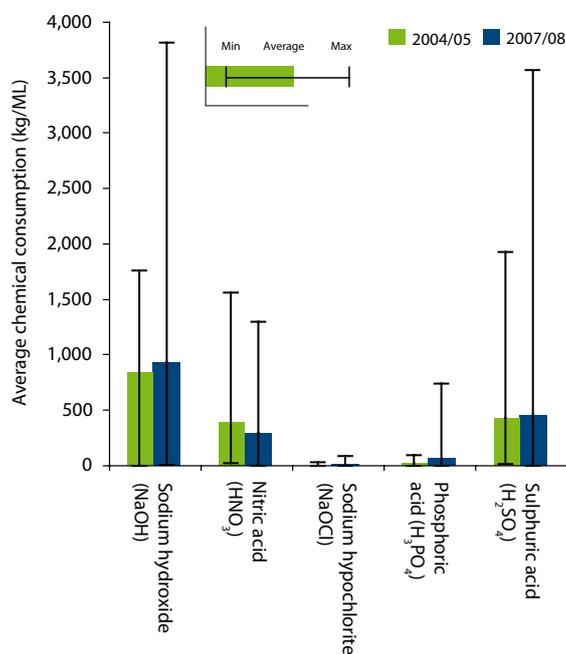


Figure 20: Chemical use.

## Collective investment in dairy innovation

As well as sharing information on current energy saving practices, Australia's dairy manufacturers jointly fund R&D into sustainable practices. In 2007, collective investment from dairy manufacturers and dairy industry bodies established Dairy Innovation Australia. This new innovation hub delivers research to accelerate the development of new products and markets, design smarter manufacturing processes and capture, develop and share capability knowledge and expertise in the Australian dairy industry.

Some of the major projects that will have a direct benefit to the sustainability of the Industry include:

- Target 35 – already delivering process efficiency improvements in milk powder production by reducing the energy required to evaporate milk
- Cheese yield improvement – utilises the latest modelling methods to improve the yields of cheese manufacturing
- Reduction in water use using 'Pinch' analysis – aims to reduce the amount of water and energy used in dairy processing.
- Energy Project – monitors and measures energy usage across dairy processing in order to develop a work program that will help manufacturers reduce the overall energy used.

Details of the work done by Dairy Innovation Australia can be found on [www.dairyinnovation.com.au/](http://www.dairyinnovation.com.au/) or contact Dr Mike Weeks at [mweeks@dairyinnovation.com.au](mailto:mweeks@dairyinnovation.com.au).

# Environmental management

Dairy manufacturers are improving their ability to manage their environmental performance through participating in government-led voluntary and compulsory programs, developing environmental management systems, and working with external parties to improve environmental performance. All larger and many smaller companies have also begun to employ dedicated environmental managers who are responsible for meeting regulatory compliance requirements and minimising environmental impacts.

## Environmental issues

Dairy manufacturers are required to manage a range of environmental issues, which can have a significant impact on the operation of a company. Manufacturers were requested to rank eight environmental issues in order of concern for their company. Water availability and energy efficiency registered the highest levels of concern for most respondents.

It is clear from the spread of results that environmental issues are highly site specific, most likely varying according to local environmental conditions, government regulations and the availability of services and resources. This is demonstrated by the minimum and maximum ratings recorded for each issue. It is interesting to note the lowest rank given to energy by any one site was five indicating that, although on average water was the biggest concern, energy issues were given a high priority rating by all sites across Australia.

Some sites chose to nominate wastewater as an additional environmental issue of concern for their site. Some noted they were struggling to meet discharge requirements, while others have made large investments in wastewater treatment systems.

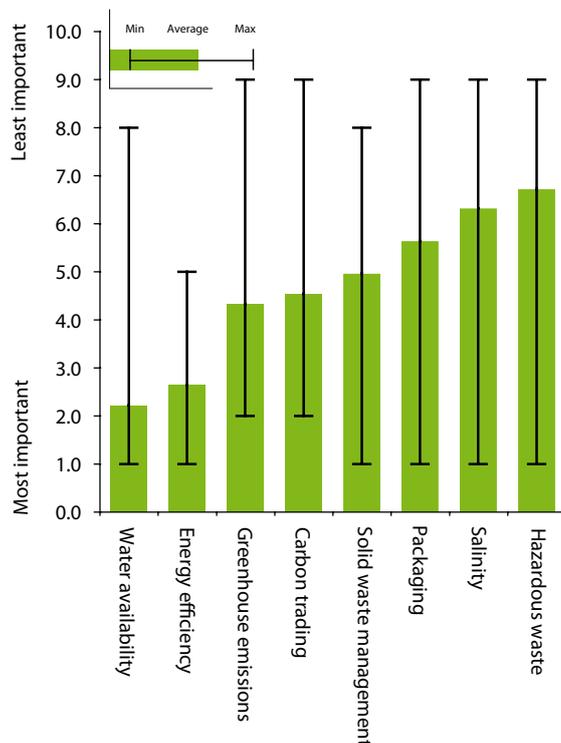


Figure 21: Environmental issues.

## Government environmental programs

Government environmental programs give companies an opportunity to gain access to expert knowledge, resources and, in some cases, financial assistance. Participation depends on the location of manufacturing sites, the availability of programs and local regulations. Dairy manufacturers across Australia have entered into a range of both compulsory and voluntary environmental programs at both a company and site-based level.

Figure 22 indicates high participation in national government programs with eight of the 11 companies surveyed participating in the voluntary National Packaging Covenant.

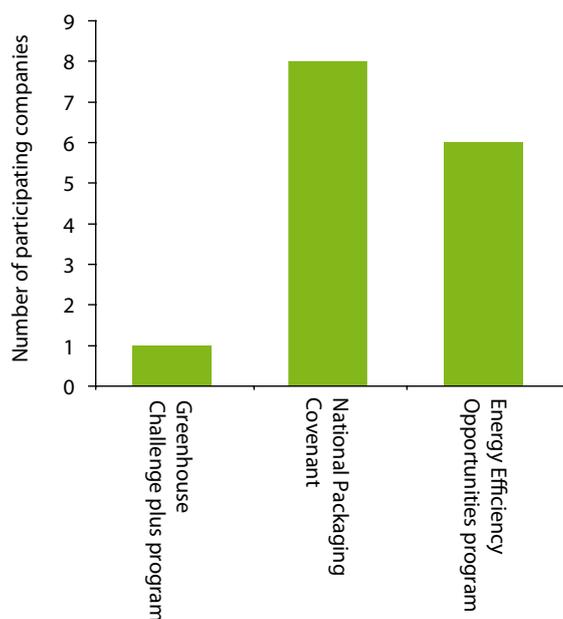


Figure 22: Company participation in Australian Government programs.

Dairy manufacturers also participated in other national programs including the Energy Efficiency Opportunities (EEO) and the Greenhouse Challenge Plus program, which assist companies to focus on reducing energy consumption. A number of companies are also required to report under the National Greenhouse and Energy Reporting System (NGERS) and the National Pollutant Inventory (NPI).

On a regional scale, state-based resource management plans registered the highest level of government program participation, with more than half (58%) participating (Figure 23).

A number of sites also participated in other environmental programs or indicated they were working with government agencies on specific environmental projects.

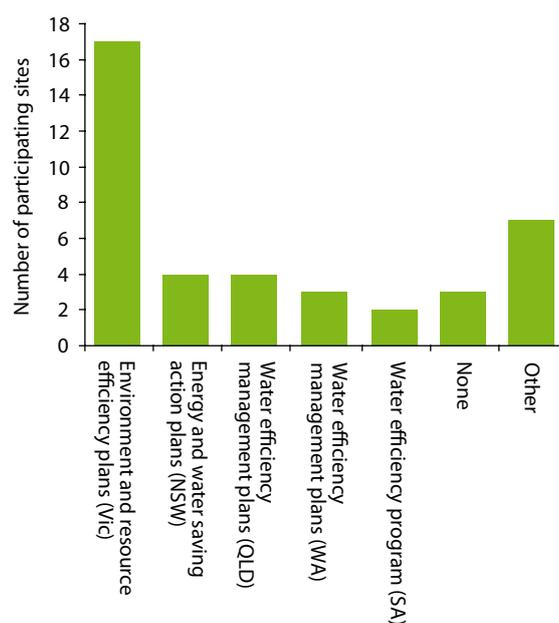


Figure 23: Site participation in State Government-based programs.

## Management systems

Management systems provide assurance to management, regulators and the general public that appropriate procedures are in place to minimise potential adverse environmental or health impacts. They also ensure that the company is implementing measures to continually improve their performance. Certified management systems provide the greatest assurance by requiring independent auditing.

Nearly all sites (96%) indicated they were HACCP (food safety) certified; 69% are ISO9000 (quality management) certified and 12% are ISO14001 (environmental management) certified.

Non-certified management systems also provide benefits for companies trying to improve their environmental performance. Formalised operating procedures linked to a management system provide ways for companies to ensure employees at all levels recognise the importance of environmental issues.

Figure 24 shows the majority (88%) of companies have developed an environmental policy. More than half the sites have developed environmental operating procedures and contingency plans, conducted environmental risk assessments, and provided environmental awareness training.

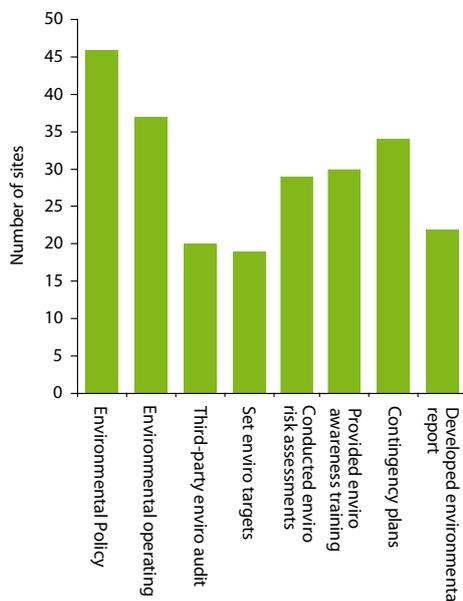


Figure 24: Site involvement in environmental programs.

## External programs

Working collaboratively with external parties such as chemical suppliers and external contractors can provide environmental and economic benefits to both parties.

For example, requesting suppliers to reduce the quantity of packaging supplied with products can reduce both the environmental and economic burden of supplying packaging and costs of disposal. Other examples include working with farmers to supply treated wastewater for irrigation and organic wastewater sludge for land application, and working with chemical suppliers to reduce chemical use. More than half Australia's dairy manufacturers are currently engaged in external programs (Figure 25).

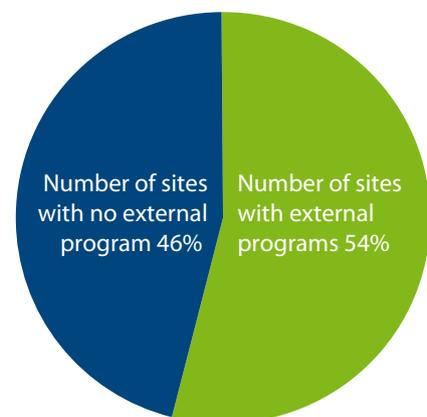


Figure 25: Involvement in external programs.

## Incidents and complaints

There has been a significant drop in incidents and complaints since the original SoE report. Since the 2004/05 survey, 134 incidents and complaints were received by industry, a decrease of almost 34% despite an increase in overall representation of processed raw milk. Strict procedures are in place to ensure all incidents and complaints are reported, with corrective and preventative action taken to address incidents that occur. Figure 26 shows a comparison of the number and type of complaints received in the 2007/08 period compared with the 2004/05 period.

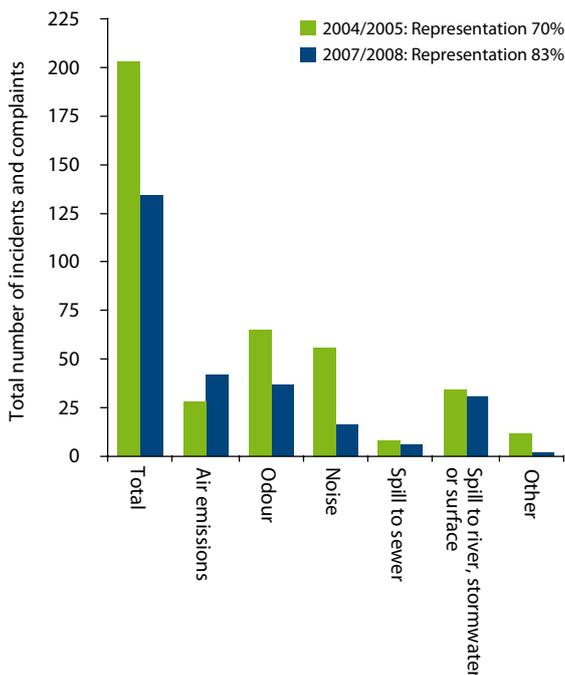


Figure 26: Incidents and complaints.

## Future initiatives and reports

Thanks to enthusiastic efforts from the dairy industry, this year's sustainability report has provided a snapshot of the current environmental performance of the dairy industry.

The report has provided (where possible) comparisons from the original SoE report to track industry progress and provided benchmark performance indicators for future sustainability reporting.

Through collaboration between manufacturers and the DMSC, improved data collection will lead to better standardisation and consistency in data collection. This will assist future reporting through easier data analysis and allow for more direct comparisons between sites and over time.

It is anticipated the next dairy industry sustainability report will assess industry performance for 2010/11.

# Appendices

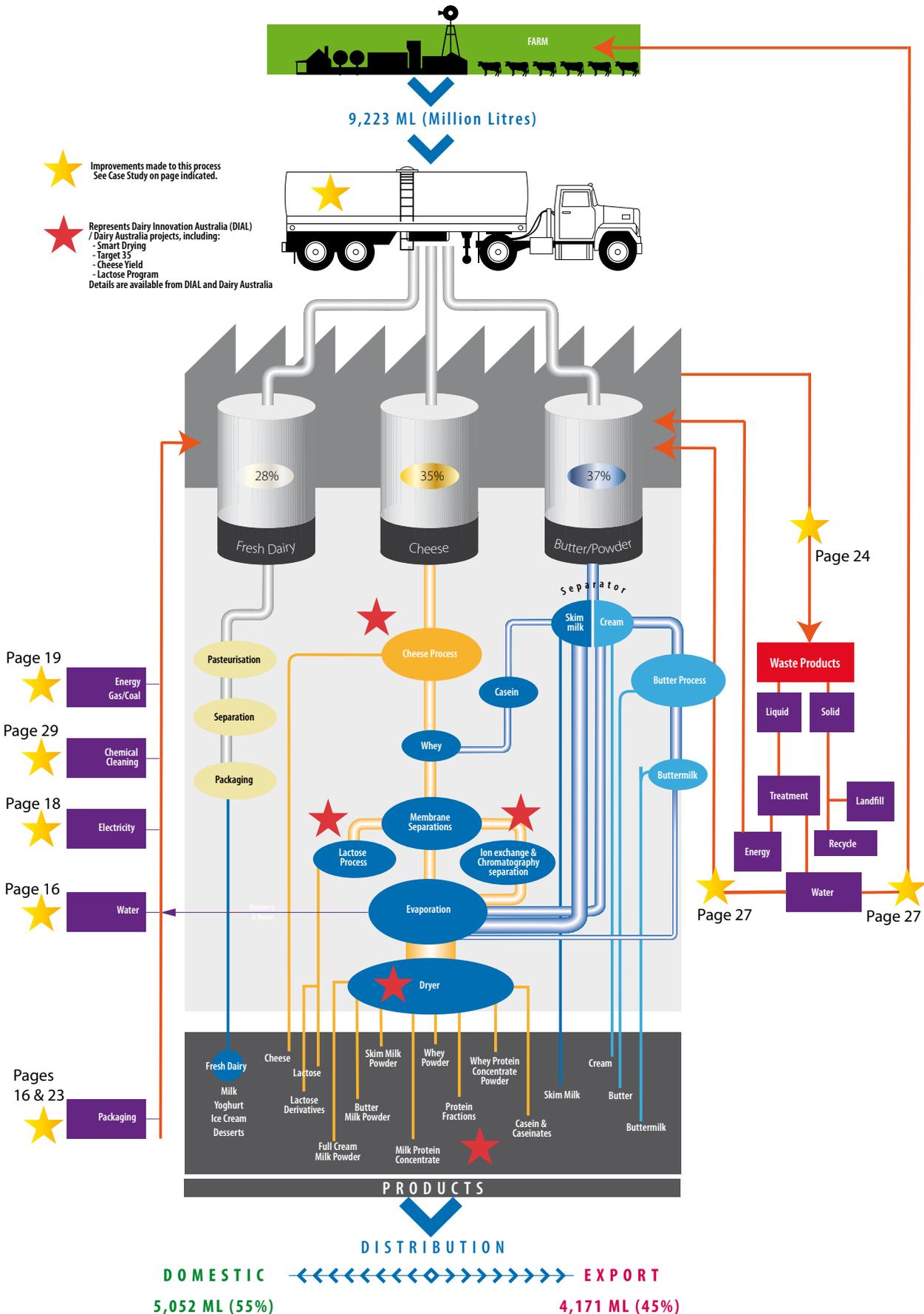
## Appendix 1 - Glossary

CIP	Clean in Place	KPI	Key Performance Indicator
CO <sub>2</sub> -e	Carbon Dioxide Equivalent	NPC	National Packaging Covenant
CPRS	Carbon Pollution Reduction Scheme	kL	Kilolitres
DAF	Dissolved Air Flotation	kt	Kilotonnes
DMSC	Dairy Manufacturers Sustainability Council	ML	Megalitres
EEO	Energy Efficiency Opportunities	Mt	Megatonnes
GHG	Greenhouse Gases	NGERS	National Greenhouse and Energy Reporting Systems
GJ	Gigajoules	NPI	National Pollutant Inventory
		SoE	State of Environment Report 2004/05

## Appendix 2 – Web links

Bega Cheese Co-operative	<a href="http://www.begacheese.com.au">www.begacheese.com.au</a>
Burra Foods	<a href="http://www.burrafoods.com.au">www.burrafoods.com.au</a>
Challenge Dairy Co-operative	<a href="http://www.challengedairy.com.au">www.challengedairy.com.au</a>
Closing the Loop Project	<a href="http://www.diaa.asn.au/resources/closing-the-loop/112/default.aspx">www.diaa.asn.au/resources/closing-the-loop/112/default.aspx</a>
Dairy Australia	<a href="http://www.dairyaustralia.com.au">www.dairyaustralia.com.au</a>
Dairy Farmers	<a href="http://www.dairyfarmers.com.au">www.dairyfarmers.com.au</a>
Fonterra	<a href="http://www.fonterra.com">www.fonterra.com</a>
Murray Goulburn Co-operative	<a href="http://www.mgc.com.au">www.mgc.com.au</a>
National Foods	<a href="http://www.natfoods.com.au">www.natfoods.com.au</a>
Norco Foods	<a href="http://www.norcofoods.com.au">www.norcofoods.com.au</a>
National Packaging Covenant	<a href="http://www.packagingcovenant.org.au">www.packagingcovenant.org.au</a>
Parmalat	<a href="http://www.parmalat.com.au">www.parmalat.com.au</a>
Tatura Milk Industries	<a href="http://www.tatmilk.com.au">www.tatmilk.com.au</a>
Warrnambool Cheese and Butter Factory	<a href="http://www.wcbf.com.au">www.wcbf.com.au</a>

Dairy manufacturing is a complex business. Three major production processes (illustrated below) are used to produce fresh dairy products, cheese and whey, and butter and range of milk powders. The yellow stars highlight the main areas of the production process where environmental savings are being made. The page references next to the stars refer to case studies in this report that are examples of the various environment improvements.



For further information or feedback regarding this report, contact:

Neil van Buuren

Dairy Australia

E-mail: [nvanbuuren@dairyaustralia.com.au](mailto:nvanbuuren@dairyaustralia.com.au)

Report authors:

Will Kershaw and Jane Gaffel

UNEP Working Group for Cleaner Production at

The University of Queensland through UniQuest

E-mail: [w.kershaw1@uq.edu.au](mailto:w.kershaw1@uq.edu.au), [j.gaffel@uq.edu.au](mailto:j.gaffel@uq.edu.au)

## Participating organisations

