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The Australian beef industry

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Foreword

Agriculture is under pressure to demonstrate its performance credentials — in particular, its environmental credentials — and to inform the community about its management practices. The agricultural sector recognises that failure to respond to this pressure may constrain future access to natural resources and markets and increase the risk of regulation of agricultural practices.

Since 1997, the National Land & Water Resources Audit has played an important role in the national coordination, collation and reporting of data and information. Under Signposts, government, industry and research bodies have collaborated in providing strategic direction and in exchanging data and information.

Signposts provides access to social, economic and environmental data specific to an industry and geographical area to inform policy development, strategic decision making and future research priorities. The Signposts reporting framework has been designed to align with other government reporting initiatives, including the evaluation framework for natural resource management programs such as Caring for our Country and Landcare.

The partnership built under Signposts needs to continue, to ensure an ongoing legacy of cross-agency collaboration in reporting.

Geoff Gorrie

Chair

The National Land & Water Resources Audit Advisory Council and Signposts Reference Group

Acronyms and abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ASCC	Australian Safety and Compensation Council
CO_2e	carbon dioxide equivalent
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EMS	environmental management system
ESD	ecologically sustainable development
GHG	greenhouse gas
GL	gigalitre
GLM	Grazing Land Management
GVP	gross value of production
ha	hectare
LWG	live weight gain
MLA	Meat & Livestock Australia
MSA	Meat Standards Australia
NAP	National Action Plan for Salinity and Water Quality
NFF	National Farmers' Federation
NLWRA	National Land & Water Resources Audit ('the Audit')
NRM	natural resource management
R&D	research and development
RDC	research and development corporation

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Signposts for Australian Agriculture (Signposts)

Industries are increasingly being required to account for their economic, social and environmental contribution.

Such accountability is driven by community expectations for socially and environmentally responsible business, market preferences for products and services produced in a sustainable and healthy way, and international and domestic regulations requiring compliance with social and environmental best practice.

Signposts is an initiative of the Australian Government that will allow industry and government to provide the information necessary to respond to the community and market expectations and demands that are arising in Australia and internationally. Signposts currently relies on the availability of data derived primarily from the National Land & Water Resources Audit and hence depends on the continuation of this program.

The Signposts framework has been designed to answer the question: 'How do Australian agricultural industries contribute to ecologically sustainable development (ESD)?'

Through this question, Signposts provides a platform for compiling data and communicating information that can be used to:

- build an industry's credentials in markets and the community for highly valued economic, environmental and social performance
- address community perceptions of the industry's management and activities
- identify priority issues and areas for planning and action.

This report is about the contribution of the beef industry to ESD. It is largely based on data compiled through the web-based Signposts industry profile of Australian beef.[1]

In some cases, the Signposts data are supplemented by other government and industry sources, where these provide a more complete and up-to-date description of the report's topics. The availability and quality of data vary, and the ability to monitor trends in ESD objectives will depend on continuity and ongoing improvements in data collection and reporting for key indicators.

The report has been prepared with the cooperation of Meat & Livestock Australia (MLA) and relates to the beef cattle production component of MLA's red meat industry portfolio.

Herd of cattle in a grazing area (photo by Arthur Mostead 2004)

From a public policy perspective, government is interested in and monitors the economic, social and environmental performance of the industry. It strongly supports the role of the beef industry in Australia

[1] See http://signposts4ag.com

and its contribution to the nation's economy, to the nutrition and health of Australians, and to the care of the continent's natural resources and environment.

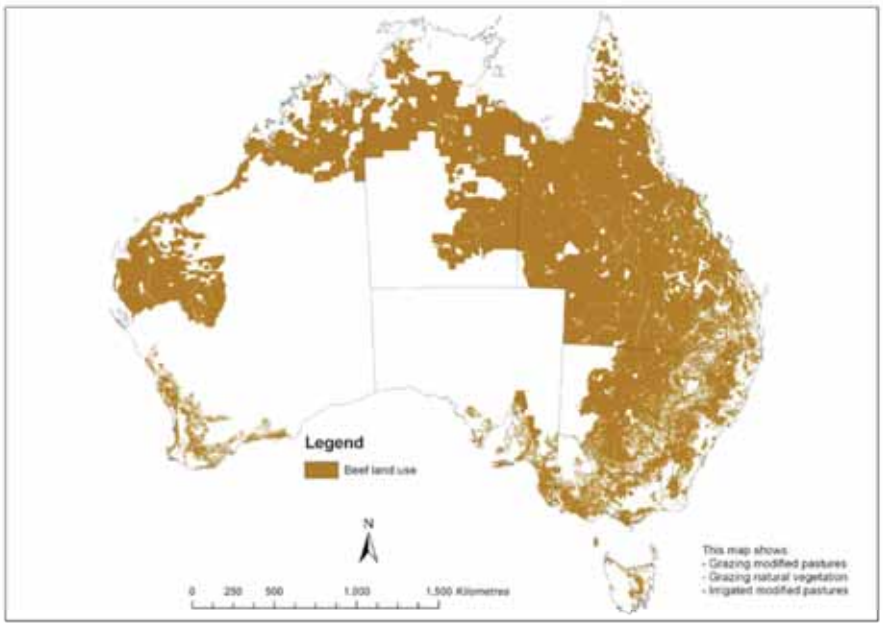
In turn, MLA recognises the need to develop community trust in the red meat industry, both in Australia and overseas. MLA has identified the need to maintain and strengthen the industry's high level of integrity as one of eight critical success factors for 2007–08. It has also embarked on long-term investments to demonstrate to urban communities that the industry has sound and progressive practices, particularly in vital areas such as environmental stewardship, food safety and animal welfare.

This report aims to reach some conclusions on how the industry is performing, based on Signposts' ESD indicators. Conclusions in this summary are supported in the report; the data and reports on which these conclusions are based are cited in the body of the report.

Key learnings from the Australian beef industry

The Australian beef industry is a major contributor to ESD in Australia in economic, environmental and social terms. Beef production is Australia's second largest agricultural industry. In 2006–07, the gross value of production (GVP), including live cattle exports, was $7.99 billion (see Table i). The industry extends over almost half of Australia's land mass across all climatic zones (see Figure i) and is Australia's most extensive industry. This means that, environmentally, it has a closer association with more of Australia's land resources than any other agricultural industry. Similarly, in economic and social terms it relates to more rural and regional communities, including Indigenous Australians, than any other industry.

Figure i Australian beef land use



Source: Adapted from NLWRA (2006) by BRS and CSIRO.

Economic contribution

Table i Gross value ($'000m) of Australian livestock slaughterings and cattle exported live, 2001–02 to 2006–07

	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07
Cattle and calves slaughtered	6617	5842	6341	7455	7325	7550
Cattle exported live	526	569	318	374	358	437
Total	**7143**	**6411**	**6659**	**7829**	**7683**	**7987**

m = million
Sources: ABARE (2007b, 2008)

Gross value of beef production

The long-term trends in industry GVP and beef cattle numbers show the increasing productive capacity of the industry to supply domestic and export markets. The industry's GVP has doubled in nominal terms since the mid-1990s.

The beef industry is currently well placed to be a strong force in supplying the growing world demand for protein. It is a vital industry in Australia's food supply and food security, providing the main component of red meat demand. Australians consumed 36.3 kg of beef per person in 2006–07. Beef is a primary source of high-quality protein and essential nutrients for Australians.

Beef exports

The beef industry has exported an average of 65% of annual beef and veal production since 2000. In international terms, it outperforms other countries in export sales from a small production base. The Australian beef industry has around 3% of the world's cattle inventory and produces 4% of the world's beef supply, but is the second largest exporter of beef after Brazil.

A significant part of the export success can be attributed to the focus of MLA's strategies and actions in growing demand, increasing market access and building strong consumer trust in the industry and its products. It can also be attributed to the capacity of Australian producers to reliably supply high-quality, healthy and safe product, in the face of a continuing decline in terms of trade.

Snapshot

In 1999, Gippsland beef and lamb farmers formed a beef marketing brand that sold grass-fed beef based on a quality assurance system. This was supported by a pilot project run through MLA that looked at whether international environmental management systems were applicable to Australian agriculture. Eight years later, 60 farmers now earn a 15% premium from their Enviromeat brand and are educating consumers about the benefits of buying a product backed by a formal environmental management system that complies with the International Organization for Standardization ISO14001 environmental management standards.

Net worth per farm

The continued profitability of beef producers is vital to the industry's capacity to grow. Although farm cash incomes declined markedly in 2006–07 as drought reduced production, input costs rose and prices fell, the net worth position of beef producers is relatively sound and provides a base for new investment as economic and seasonal conditions improve.

The equity position of beef producers and their capacity to invest have been substantially strengthened by rising land prices, resulting in high rates of return on capital when capital appreciation is included (averaging 11.2% per year over the past 3 years).

Industry productivity

The capacity of the industry to increase production and sales is largely due to its ability to increase productivity. Total factor productivity for the beef industry shows an overall increasing trend since the late 1970s to 2005–06, with the average productivity growth being 1.4% per year.

Productivity growth has been achieved through:

- advanced breeding genetics
- improved herd, pasture and disease management
- the advent of lot feeding in turning off cattle
- the development of the live cattle trade, stimulating higher weaning rates and lower age of turnoff in northern herds.

Decreasing commodity prices (in real terms) and increasing input prices mean that the beef industry is under constant pressure to increase the efficiency of production in order to maintain viable levels of business profitability. MLA has identified the need for the whole red meat industry to enhance its competitiveness and sustainability as a strategic imperative.

Environmental contribution

Adaptation to the environment

The beef industry is Australia's most extensive agricultural industry in terms of the proportion of the Australian landscape where cattle are raised. The industry is managed to match the environment in which it exists. In northern regions, there are low stocking rates over extensive areas, with low inputs. In southern regions, farms are smaller, with higher inputs in terms of improved pastures, fertiliser use and, in some cases, irrigation. As Australia's most extensive industry in land area, the beef industry gives high priority to natural resource management and environmental conservation.

Cattle crossing a river, Copmanhurst, via Grafton, New South Wales (photo by Margaretta Fahey 2006)

Climate risk management

Australian beef producers are among the most resilient in the world in dealing with climate variability. Beef is a predominantly dryland industry based on natural rainfall, and drought has major impacts on the GVP and productivity. Indicators suggest that Australian producers are improving their risk management for climate variability.

Water

Water is a key factor of production in the beef industry as it is essential for the survival and productivity of cattle. Australian water statistics do not separate water consumption for beef cattle and for other livestock; in 2004–05, total water consumption for livestock was 1035 gigalitres (GL) (8% of total water consumed in agriculture in that year). Irrigation of pastures (other than for dairying) consumed 1928 GL of water in 2004–05, representing 16% of total agricultural water use. However, assessment of water consumption needs to take account of the volume and value of production. The industry gives high priority to water use, and MLA is currently undertaking research that will provide accurate data on the amount of water and energy used to produce a kilogram of beef.

Soils

Healthy and productive soils are fundamental to the sustainability of the beef industry. Beef producers manage their soils to maintain fertility levels appropriate to the intensity of their operations. Producers are increasingly using effective tools to match fertiliser application to plant needs. Problems of salinity, acidity and erosion that reduce soil fertility are high priorities for the industry and are being effectively addressed at the farm, catchment and landscape levels.

Snapshot

A focus of MLA investment in reducing soil erosion has been the Burdekin River catchment. This is one of the largest catchment systems affecting the Great Barrier Reef, and careful management of nutrient and sediment runoff is essential to maintain water quality and the health of the reef ecosystem. The grazing industry has made major advances towards reducing its contribution to sediment loss in the Burdekin catchment, using knowledge gained from several MLA-funded projects.

Biodiversity and remnant vegetation

Biodiversity — an issue of national and state importance — is identified by MLA as a priority natural resource management issue for the red meat industry. The beef industry recognises that healthy, productive and diverse ecosystems are very important to its viability and sustainability.

Beef producers have responded to the challenge of biodiversity conservation by:

- taking areas out of production in order to revegetate
- fencing remnant and revegetated areas to exclude stock and feral animals
- planting tree belts to protect stock and provide shelter for native fauna.

Greenhouse gas emissions

Sources of greenhouse gas emissions from the beef industry include:

- methane from cattle digesting feed (enteric fermentation)
- nitrous oxide from soils
- carbon dioxide from the operation of fossil-fuelled machinery
- savanna burning in northern Australia
- methane emissions from stored manure in feedlot production

- changes in land use, such as clearing.

By ceasing broadscale land clearing, the industry has already made a major contribution to greenhouse gas mitigation since 1990, enabling Australia to be on track to meet its target under the Kyoto Protocol. These savings more than offset the total gross emissions attributed to the beef industry in 2005.

Summary measure

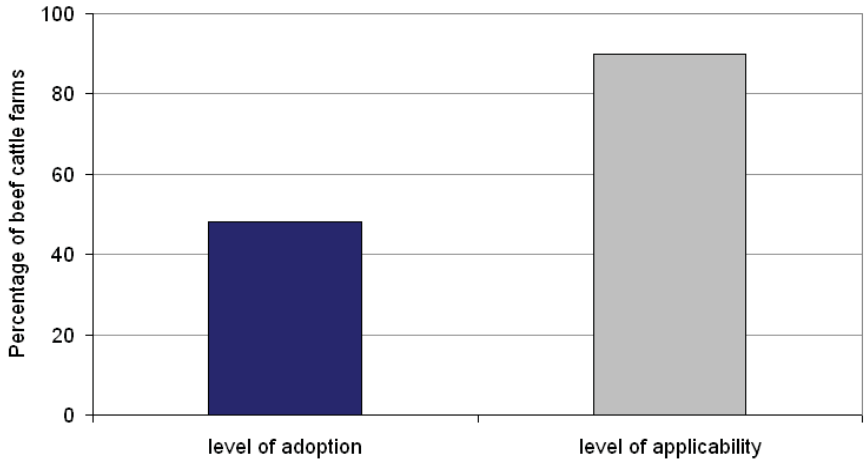
Signposts uses the proportion of beef cattle farms maintaining areas of conservation value as an indicator of biodiversity conservation. Its summary measure is the number of beef cattle farms maintaining areas of conservation value on their property as a proportion of beef cattle farms that can potentially maintain areas of conservation value on their property.

The results from the National Land & Water Resources Audit in 1999 (NLWRA 2001a) show that 'maintaining areas of conservation significance' is applicable to about 90% of the surveyed beef cattle farms, and the practice is being adopted on about 50% of farms (see Figure ii). Based on these data, the summary measure is 0.53.

MLA estimates that the red meat industry has reduced its total gross emissions of greenhouse gases by 6% and reduced emissions per tonne of production by more than 12% as a result of efficiency gains made since 1990.

MLA's research indicates that 'high feed efficiency cattle can produce 15% less methane and 17% less nitrous oxide per day than inefficient cattle'.

Figure ii The applicability and adoption of 'maintaining areas of conservation significance' for beef cattle farms, 1999



Source: NLWRA (2001a)

Social contribution

In social terms, the extensive distribution of beef production means the industry relates to more rural and regional communities, including Indigenous Australians, than any other industry.

Cattle sale in Roma, Queensland (photo by Arthur Mostead 2006)

Employment

The beef industry accounts for a substantial proportion of all employment in the agriculture sector. In the 2001 Australian census, 47 086 people were employed in beef cattle farming (Table ii). This represented 22% of total agricultural employment, of which 16% related to specialist beef farms. In addition to specialist beef farms, 18 052 people were employed in sheep–beef cattle farming.

Table ii Total number of people employed in beef cattle farming in Australia

State	Farmers or farm managers	Other employees	Total
New South Wales	9 987	3 371	13 358
Victoria	6 507	1 336	7 843
Queensland	11 774	6 575	18 349
South Australia	1 327	501	1 828
Western Australia	2 260	1 090	3 350
Tasmania	939	243	1 182
Northern Territory	279	825	1 104
Australia Capital Territory	48	24	72
Total	**33 121**	**13 965**	**47 086**

Source: NLWRA (2001a), ABS (2002)

The beef industry also provides employment for Indigenous Australians. In the 2001 census, 1477 people who responded said that they were Indigenous and working in grain, sheep and beef cattle farming.

Learning and training

Beef producers are active participants in learning and training activities. MLA itself provides a range of opportunities for learning, training and further education for producers, researchers, students and workers

in the red meat industry. In the past five years, some 34 500 producers have been involved in various MLA-initiated activities.

Health

Over the past decade, occupational injuries in the industry have declined as improved occupational health and safety practices have been adopted.

The beef industry also contributes to the health of Australians by providing an affordable source of high-quality, protein-rich and nutrient-rich food.

Social capital

The beef industry, its associated infrastructure, transport mechanisms and links to ports, and its network of policy, regulatory and market-based organisations, is a major contributor to the development of the economic and social structure of Australia,. The industry is part of an extensive value chain from the farm gate to consumers. In addition, it has led to the creation of an extensive service sector. Producers participate in a wide range of industry and community organisations at local, regional, state and national levels.

National culture and identity

Australia's livestock grazing industry is a significant part of national and regional cultures and identity. MLA gives high priority to maintaining high levels of community trust and pride in Australia's cattle industry. It undertakes a range of activities to reconnect urban and rural Australia so that the importance of agriculture to all citizens is better understood and appreciated.

Introduction

This Signposts report on the beef industry is one of six initial reports on the contribution of Australia's major agricultural industries to ecologically sustainable development (ESD).

What is ESD?

The Australian *National Strategy for Ecologically Sustainable Development* (Council of Australian Governments 1992) defines ESD as:

Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

In the Signposts framework, ESD is interpreted as an overall increase in the value of the nation's capital assets (ie in its produced capital, human capital, social capital and natural capital) that is available to increase the wellbeing of the Australian population. Similarly, at an industry level, ESD is interpreted as an increase in the value of the industry's capital that is available to produce income and environmental and social benefits both to the industry's stakeholders and broader society.

Partnership with industry

This report has been prepared with the cooperation of Meat & Livestock Australia (MLA) and relates to beef cattle production. It does not encompass the whole of MLA's industry portfolio. MLA is a producer-owned company that provides research and development (R&D) and marketing services to the red meat industry. The company works in partnership with industry and government in pursuit of its goal of a profitable and sustainable red meat and livestock industry. It services more than 170 000 levy-paying producers of cattle, sheep, lambs or goats, of whom 43 500 have chosen to register as members of the company and receive regular reports on marketing and R&D information.

MLA's strategic plan for 2006–2011 is driven by the vision of industry sustainability, international competitiveness and profitability. Included in its seven themes are strategies for demonstrating industry achievements in areas of community concern and managing social compliance issues such as animal welfare, methane/greenhouse gas emissions, effluent disposal and land clearing.

This theme is also actioned through MLA's *Annual Operating Plan 2007–08*. Furthermore, a framework has been developed for communicating the impact of MLA's investment in natural resource management and for promoting the sustainable development of the red meat industry.

For cattle producers, MLA operates industry programs that focus R&D and marketing activities, and support industry systems, to assist the growth and competitiveness of the industry. These include the *Southern Beef*, *Northern Beef* and *More Beef from Pastures* R&D programs, continual updating of the BREEDPLAN genetic evaluation scheme, the National Livestock Identification Scheme, the Meat Standards Australia eating quality assurance scheme and the Livestock Production Assurance scheme for on-farm food safety and quality management, and a range of market promotion programs and market reporting services.

The Signposts framework

This report is largely based on data that have been compiled through the web-based Signposts Industry Profile of Australian beef.[2]

In some cases, the Signposts data are supplemented by other government and industry sources, where these provide a more complete and up-to-date description of the report's topics. The availability and quality of

[2] See http://signposts4ag.com

data vary, and the ability to monitor trends in ESD objectives will depend on continuity and ongoing improvements in data collection and reporting for key indicators.

This report does not repeat the conceptual and definitional material of Signposts, and readers seeking this information can access the Signposts website.

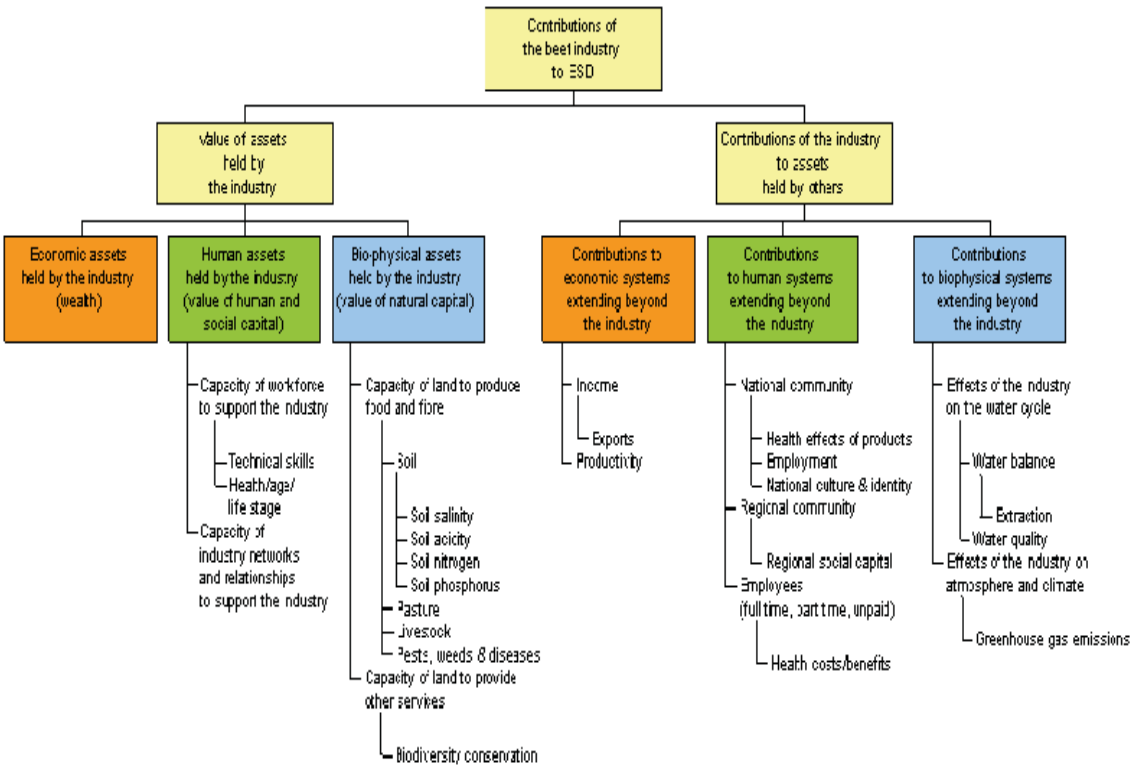
MLA's key planning, reporting and communications instruments are:

- *Meat Industry Strategic Plan 2004–2009*
- *MLA Strategic Plan 2007–2011*
- *Annual Operating Plan 2007–08*
- annual reports
- MLA program evaluation series for 2007–2010.

The report recognises that, at this stage in the development of Signposts, many of the components and subcomponents have not been populated with the required data.

Data imperfections are a fact of life in most industry reporting, but Signposts provides a platform that allows information to be updated, refined and extended over time to reflect industry and government priorities. The Signposts framework envisages that a complete dataset and means of analysis of the industry's contribution to ESD, as shown in Figure 1, can be established.

Figure 1 Signposts for agriculture — beef industry profile



ESD = ecologically sustainable development
Source: http://signposts4ag.com/signposts-horticulture/full-component-tree

Use of Signposts industry reports

The report seeks, to the greatest extent possible, to accommodate the reporting needs of both the government and industry.

From a public policy perspective, government is interested in and monitors the economic, social and environmental performance of the industry.

Similarly, the industry itself monitors these variables for a variety of purposes:

- advising government and making a contribution to public policy development
- providing information about the industry to its stakeholders to better inform decision making at the business level
- meeting reporting requirements arising from statutory obligations, the need to inform markets and consumers, and the need to inform financial markets that supply funds to the industry for investment
- to promote the industry within the broader society.

The economic contribution

Signposts examines the economic contribution of the beef industry to Australia from four key perspectives:

- the contribution of the industry to national income through production of beef, which is supplied to domestic and international markets
- the contribution of the industry to exports, as the growth in the industry's income and Australia's national income rely heavily on exports
- the value of the industry's assets that currently yield income or have the potential to yield future income
- the industry's total factor productivity, which indicates its actual performance and potential to contribute to growth in production, income and profits.

This report is about beef production and the on-farm sector of the industry. However, this sector is only one part of a wider red meat economy. The output of beef cattle provides the raw material for other sectors of the economy, including meat and other byproducts. The farm sector produces a good that is supplied through a complex value chain through to the sale of meat to consumers in Australia and overseas, creating income for other industries.

In addition to being part of a value chain, beef production — like other agricultural industries — has led to the creation of an extensive service sector that provides transport, storage, selling, marketing, brokering, financial information, research, consulting, education and training services.

The on-farm sector also contributes to the wider economy through the multiplier effects of incomes earned from beef production being spent in other sectors of the economy. This is a very important contribution to many rural communities that lie within the extensive area of cattle production in Australia.

Gross value of beef production

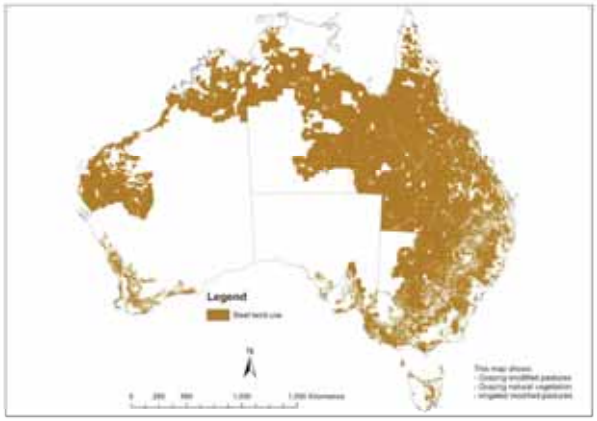
The Australian Bureau of Agricultural and Resource Economics defines the Australian beef industry as comprising all broadacre farms with more than 50 head of cattle (ABARE 2007a). It classifies a farm as a specialist beef producer if it earns more than 50% of total cash receipts from the sale of beef cattle. Using these definitions, around 53% of farms in the broadacre cereal cropping and livestock grazing industries are considered to be in the beef industry. These farms carry around 96% of all beef cattle on broadacre farms. Around 58% of farms in the beef industry are categorised as beef specialists.

The beef industry is widely distributed across Australia and occupies around half of the continent's land area (see Figure 2).

In northern Australia, beef production is based mainly on native pastures on extensive properties. In southern Australia, it is carried out on smaller properties, with widely varying proportions of improved pastures in dryland and irrigated situations. Many of the southern farms are mixed enterprises with grain growing or other livestock. The industry also includes beef feedlots, in which cattle are raised intensively with fodder and grain feeds. Cattle are sold either for processing in abattoirs or exported live.

Beef production is Australia's second largest agricultural industry. In 2006–07, the estimated gross value of slaughterings of cattle and calves was $7.55 billion (ABARE 2008). With the addition of live cattle exports, valued by the Australian Bureau of Agricultural and Resource Economics (ABARE) at $437 million for 2006–07, the estimated gross value of production (GVP) for the beef industry is $7.99 billion (see Table 1).

Figure 2 Australian beef land use



Source: NLWRA (2006)

There are more than 70 000 Australian farms with cattle. The total number of beef cattle at June 2007 was 25.6 million (ABARE 2008). Dairy cattle contributed a further 2.65 million to a national cattle herd of 28.25 million. In recent years, Australia's cattle numbers have been at the highest level since the 1970s, when the national cattle inventory reached 32.67 million in 1976.

At the national level, the desired outcome for an industry is that its net contribution to the economy is positive and increasing over time. In the absence of net value of production statistics (ie aggregate farm business gross revenue generated from the production of agricultural goods minus production costs), the GVP for 'slaughtered cattle and calves' and 'exported live cattle' is an indicator of the industry's productive capacity.

The beef industry's GVP has doubled since the mid-1990s, with a significant downturn following the 2002–03 drought. Although the GVP is likely to have increased in 2006–07 as a result of higher turnoff of cattle due to drought conditions, it is forecast to decline in 2007–08 (ABARE 2008). The decline will not be as significant as that following the previous drought, which may reflect improving drought risk management in the industry.

Table 1 Gross value of Australian livestock slaughterings and cattle exported live, 2001–02 to 2006–07

	2001–02 $'000m	2002–03 $'000m	2003–04 $'000m	2004–05 $'000m	2005–06 $'000m	2006–07 $'000m
Cattle and calves slaughtered	6617	5842	6341	7455	7325	7550
Cattle exported live	526	569	318	374	358	437
Total	**7143**	**6411**	**6659**	**7829**	**7683**	**7987**

m = million
Sources: ABARE (2007b, 2008)

Industry GVP is driven by climatic conditions, exchange rates, beef prices and developments in Australia's largest export markets, including Japan, the United States and the Republic of Korea. Demand for Australian beef cattle has remained strong in Asian export markets in recent years, which has provided support for Australian saleyard prices. While prices weakened in 2006–07 as slaughterings increased, they are still relatively favourable in historical terms. However, ABARE forecasts that Australian beef will face increased competition from the United States in Japan and the Republic of Korea in 2008–09.

MLA's strategic imperatives are to grow domestic and overseas demand for Australian beef and increase market access in pursuit of growth in industry value and profit.

The consumption of beef and veal for Australian consumers is estimated to have been 36.3 kg per person in 2006–07. As expected from changes in Australian meals, current per capita consumption is well below the high level achieved during the 1970s, when consumption reached a record 70.3 kg per person and averaged 53.4 kg over the decade.

A key factor in stimulating domestic demand will be demonstrating that quality beef can be produced from environmentally friendly production systems. Enviromeat is a success story of beef producers who are earning a premium from an environmentally branded product.

Case study 1 Meat Standards Australia

Overview

Meat Standards Australia (MSA) is a voluntary meat grading system. This ongoing program aims to:

- improve beef quality
- improve consumer certainty about beef quality
- strengthen supply chain linkages
- give MSA-registered producers access to standards, best practice guidelines and individual feedback.

Characteristics

Approximately $210 million is to be invested over a 30-year period. The expected outcomes include higher beef eating quality and consistency. It is expected that 80% of eligible beef will be processed under MSA by 2010.

The process is expected to increase domestic demand by 6.7% by 2010 and export demand by 0.3% in the same year. It will mean a 3% cost increase imposed on processors, with the highest impact on processors of grain-fed product.

MSA will increase the skill of regional workforces, providing training for 14 000 employees in the red meat processing sector by 2010.

Who is involved?

MLA's engagement with supply chain stakeholders, including major retailers and food service providers, has been backed by high-profile consumer promotions. These efforts have stimulated demand-driven industry adoption of program outputs, with growing evidence of benefits flowing back to the producer.

Benefits and beneficiaries

The Eating Quality program is delivering social benefits, including higher incomes, extensive training and up-skilling, and reduced occupational health and safety risks.

The $210 million investment in MSA beef will pay off over the next 30 years. It is expected to generate $932 million in red meat industry added value and $3.4 billion net benefits to Australians.

The performance targets for MSA beef set by the industry steering committee in 1996 were to achieve a 10% price premium for MSA beef products, and at least 30% of beef carcases being MSA-graded by 1999.

Point-of-sale data comparing prices for similar graded and ungraded cuts demonstrate that price premiums have exceeded the target, although it took 10 years to achieve this. Processor adoption of MSA carcase grading has taken longer than originally anticipated and is only now approaching the 30% target.

Beef exports

With Australia's relatively small population, the economic growth of the industry is highly reliant on exports. The domestic market consumed an average of 35% of annual beef and veal production from 2000 to 2006, and 65% was exported.

In 2006–07, the industry exported beef, veal and live cattle (excluding breeding cattle) to the value of $5.3 billion (see Table 2). Average annual export sales since 1999–2000 were $4.8 billion; this is a notable achievement, given the impact of two severe droughts during that period.

Table 2 Value of exports of beef, veal and live cattle ($ million fob), 1999–2000 to 2006–07

Year	1999–2000	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	8-year average
Beef and veal	3119	4007	4189	3756	3793	4584	4272	4634	4044
Live cattle[a]	846	846	797	977	581	574	549	638	726
Total	**3965**	**4853**	**4986**	**4733**	**4374**	**5158**	**4821**	**5272**	**4770**

fob = free-on-board
a Excludes cattle for breeding purposes
Sources: ABARE (2007b, 2008)

The Australian beef industry largely depends on income derived from sales outside Australia for its future growth and contribution to the nation's economy. The desired outcome for the industry is an increase of the value of exports over time. Although seasonal conditions, exchange rates, international competition and prices affect export values, the general trend has been consistent and slightly increasing exports over the period from 2000. ABARE's (2008) forecasts are for a decline in both the nominal and real value of beef exports from 2008–09 to 2012–13.

Australia is a highly effective exporter from a relatively small production base in world terms. It has around 3% of the world's cattle inventory and produces 4% of the world's beef supply, but is the second largest exporter after Brazil (MLA 2007a).

A significant part of the success can be attributed to the focus of MLA's strategies and actions on growing demand, increasing market access (including maximising market options) and building strong consumer trust in the industry and its products. The success can also be attributed to the capacity of Australian producers to reliably supply high-quality, healthy and safe product to markets.

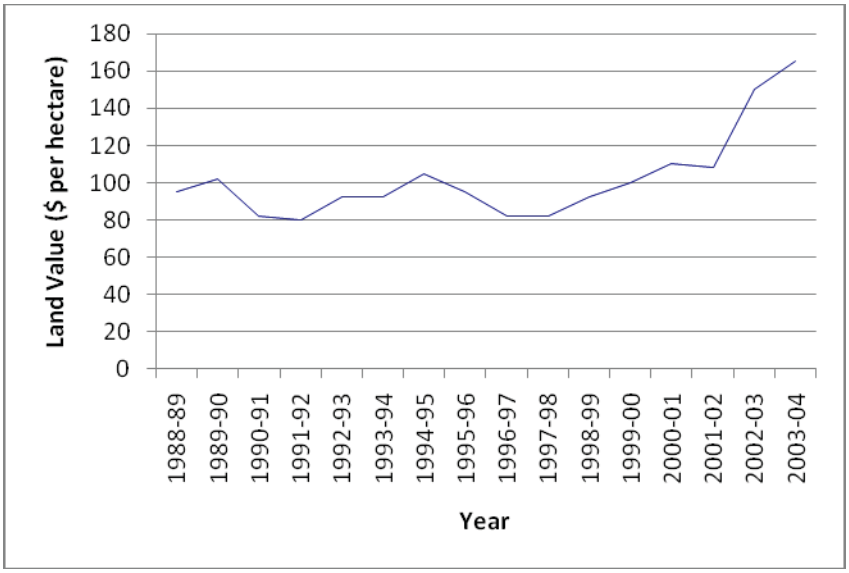
Net worth per farm

Ideally, industry wealth is measured as the net worth (ie the total value of the industry's assets minus the value of its liabilities). The desired economic position of an industry is that its net worth is positive and increasing over time. Rising net worth reflects an increasing capacity of the industry to generate income in the future and to attract further investment in the industry.

Signposts uses land value (dollars per hectare) for beef cattle farms (excluding mixed farms) as an indicator of net worth, since land is usually the major single asset of beef producers.

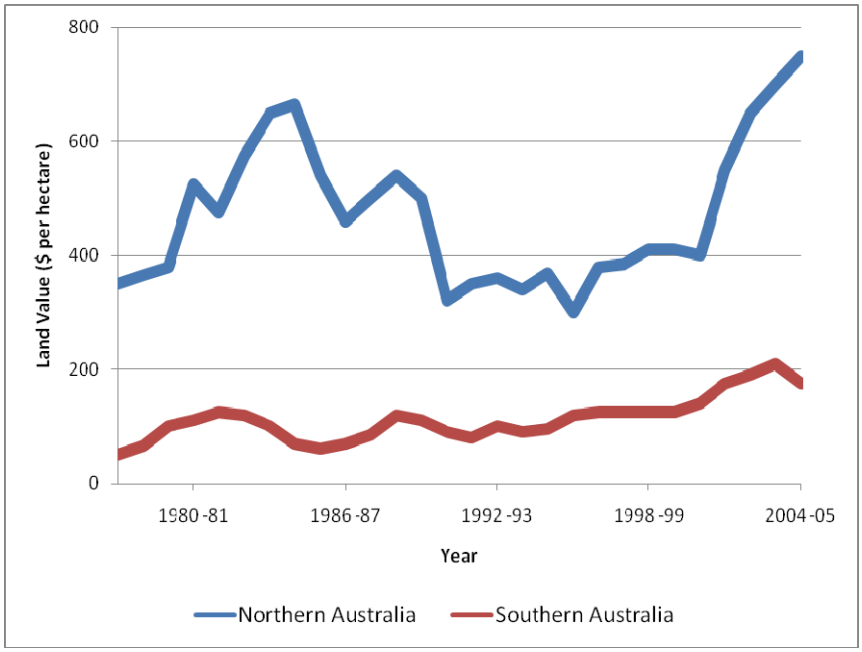
Figure 3 shows that land values have increased significantly since 1996–97. This has been in response to rising farm incomes, low interest rates and the general rise in property prices in the past decade. The difference in beef land price movements between southern and northern Australia is shown in Figure 4.

Figure 3 Farm land value for beef cattle farms (excludes mixed farms)



Source: ABARE (2007c)

Figure 4 Farm land value for beef cattle farms in southern and northern Australia



Source: ABARE (2007a)

Other indicators of industry net worth are the value of farm assets or capital and the return on capital. In 2006–07, farm capital was valued at $4.3 million per farm (preliminary estimate), which was higher than for the other broadacre industries: wheat and other crops, mixed livestock–crops, and the sheep industry. Similarly, the estimated equity position of beef producers, at $3.6 million per farm in 2006–07, exceeded that of the other broadacre industries.

Table 3 shows a significantly higher rate of return to farm capital when taking into account capital appreciation due largely to rising land value. For the three years 2004–05, 2005–06 and 2006–07, the beef industry performed significantly better than wheat and other crops, mixed livestock–crops and the sheep industry in terms of rate of return including capital appreciation. Without capital appreciation, the beef

industry's rate of return was higher than the sheep industry and the mixed livestock–crops industry, but slightly below the wheat and other crops industry in 2006–07 (preliminary).

Table 3 Farm capital results for the beef industry, average per farm

	2004–05	2005–06	2006–07[a]
Farm capital ($ million)	3.7	3.9	4.3
Net capital additions ($ million)	0.059	0.055	0.020
Equity ($ million)	3.2	3.6	3.6
Equity ratio (%)	92	93	90
Rate of return (%) (excluding capital)	1.3	0.9	0.7
Rate of return (%) (including capital appreciation)	9.7	11.1	12.9

a Preliminary data
Sources: ABARE (2007c, 2008)

Farm size is a significant factor in achieving higher rates of return without including capital appreciation, as shown in Table 4. However, when capital appreciation is included, the rate of return is slightly higher for smaller farms.

Table 4 Rates of return for smaller and larger beef farms, average per farm

	2004–05		2005–06 (preliminary)		2006–07 (provisional estimate)	
	A	**B**	**A**	**B**	**A**	**B**
Farms with less than 300 cattle	–2.2	10.5	–1.4	10.9	–1.9	na
Farms with more than 300 cattle	1.9	9.6	1.5	10.8	0.2	na

A = rate of return excluding capital appreciation; **B** = rate of return including capital appreciation; na = not available
Source: ABARE (2007c)

Farm cash incomes declined markedly in 2006–07 as drought reduced production, input costs rose and prices declined. However, the net worth position of beef producers is relatively sound and provides a base for new investment as economic and seasonal conditions improve. The equity position of beef producers has been strengthened by rising land prices, resulting in high rates of return on capital when capital appreciation is included.

Industry productivity

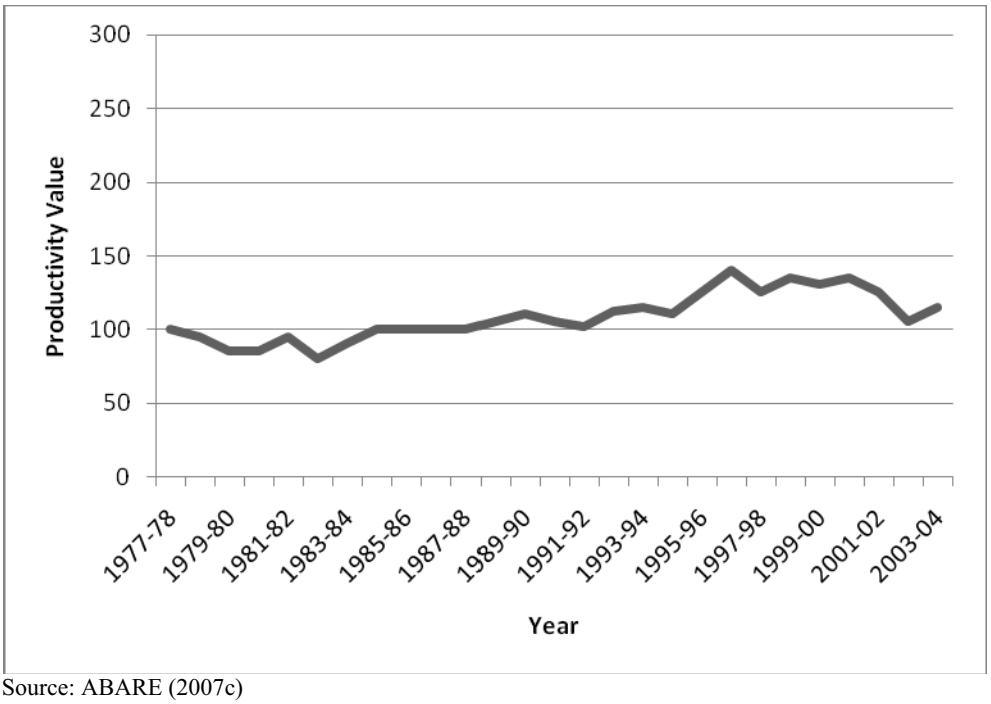
The concept of total factor productivity is a measure of on-farm productivity that compares output with the combined use of all resources. Total factor productivity is expressed as an index and is frequently used as an indicator of industry performance because it measures the effect on output of factors such as technological advances, improvements in management and exploitation of economies of scale.

Total factor productivity for the beef industry shows an overall increasing trend since the late 1970s to 2005–06, with the average productivity growth being 1.4% per year. The 2002–03 drought caused a

significant decline, as shown in Figure 5. Factors contributing to productivity growth have included advanced breeding genetics; improved herd, pasture and disease management; the advent of lot feeding in turning off cattle; and the development of the live cattle trade.

Average growth of productivity was 1.3% per year in the southern beef region and 1.2% in the northern beef region. For both regions, productivity growth has been driven by output growth (1.6% per year in the southern region and 1.3% in the northern region). Input growth has been low in the northern region, at 0.1% per year, and higher in the southern region, at 0.2% per year.

Figure 5 Total factor productivity of Australian beef farms



Source: ABARE (2007c)

Looking forward

Decreasing real prices and increasing input costs mean that the red meat industry is under constant pressure to increase efficiency to maintain current levels of business profitability (MLA 2007b). MLA's *Annual Operating Plan 2007–08* has a productivity improvement program that aims to improve the productivity, profitability and sustainability of the red meat industry (MLA 2007c).

For northern beef, MLA is aiming to 'increase liveweight gain, improve breeder performance, address key animal health concerns and develop strategies to attract and retain staff'. For southern beef, the aim is to 'improve cow herd and overall beef enterprise productivity and improve feed utilisation at the herd and individual animal level' (MLA 2007c).

The environmental contribution

Signposts addresses the environmental contribution or impact of agricultural industries in terms of biophysical assets and systems. In agriculture, the natural assets of primary interest are the atmosphere, climate, land, water and plants. Obviously, these elements are highly interlinked. In combination, they determine the capacity of farms to produce food, fibre, fuel, and ecosystem services such as biodiversity conservation and greenhouse gas (GHG) sequestration.

The MLA Environment Strategy has identified 11 priority natural resource management issues for investment by the red meat industry: water use, water quality, salinity, soil erosion, soil acidity, biodiversity, climate change, GHG emissions, weeds, feral animals, and solid waste.

Signposts addresses most of these issues in terms of the capacity of the land held by the beef industry to produce food and other ecosystem services, and in terms of the beef industry's contribution to systems beyond the industry.

Natural capacity of beef farming lands to produce food

The capacity of land to produce food is assessed in relation to climate, soil and biota (covering both the plant species available to the industry for pasture and fodder production and the impact of weeds and other plant pests and diseases).

Climate

Prevailing atmospheric conditions determine climate, along with location and topography. Rainfall is by far the most significant climatic factor in Australian beef production. Most pasture for beef is produced under dryland conditions and relies on sufficient rainfall. In some areas, irrigation of pasture and fodder is important, particularly for finishing cattle. Temperature and relative humidity are less significant factors in the beef industry due to the use of appropriate cattle breeds for different conditions.

Australian beef producers are among the most resilient in the world in dealing with climate variability. Beef is a predominantly dryland industry based on natural rainfall, and drought has major impacts on the gross value of production and productivity. There are strong indications that Australian producers, supported by R&D and extension activities provided by MLA, are improving their risk management for climate variability and in turn enhancing their productive capacity to supply markets.

MLA produces a wide range of publications and tools that can help producers with decision making during drought.

MLA's drought tools

Drought management and recovery

mlaPrograzier is a quarterly magazine that highlights how individual producers have successfully introduced best management practices into their farming enterprises and the benefits that have been achieved.

Pasture management

Tips & Tools: Looking after drought pastures

Droughts and dry seasons frequently affect southern Australia, resulting in forage shortages and subsequent pasture stress. This Tip & Tool provides producers with management tactics to help them avoid potential problems with pasture survival, recovery and composition.

Tips & Tools: Managing ground cover to reduce run-off and water loss

Water is the key to successful agriculture and the health of our ecosystems. This Tip & Tool provides producers with the principles and tactics for managing groundcover and rotational grazing to help avoid runoff, water loss and erosion.

Tips & Tools: Using the MLA Rainfall To Pasture Growth Outlook Tool

Developed with leading beef and sheep producers, the Rainfall to Pasture Growth Outlook Tool shows actual rainfall and indices of soil moisture and pasture growth for the past 9 months and an outlook for the next 3 months for more than 3300 locations across southern Australia.

Animal health and welfare

Tips & Tools: Heatload in feedlot cattle 2006

This publication includes six Tips & Tools for understanding, recognising and managing heatload in feedlot cattle.

Is it fit to load?

A national guide to the transport of animals fit to transport, 'Is it fit to load?' has been developed in consultation with the livestock industry to help producers decide if an animal is fit to be loaded for transport to saleyards, abattoirs, or any other destination.

Biota

A wide range of pasture species can be found across Australia. Types include native perennial grasses with some annual legume (eg subterranean clover), annual grasses and legume-based pastures, and sown exotic perennial grass pastures and annual or perennial legume.

The genetic resource available to the beef industry for feed production (pastures and forage plants) is a key issue for future profitability and sustainability. It is becoming increasingly important due to climate change and the impact of climate change on rainfall and water availability. In addition, the level of GHG emissions from the industry is directing attention to limiting methane emissions from animal digestion through better pasture and fodder quality.

MLA provides a range of publications and tools for producers in pasture and grazing management to improve the industry's productivity. These cover feed budgeting, grazing management, nutrition and fertiliser application, pasture response and utilisation, and a stocking rate calculator.

With regard to weeds, there are currently more than 300 pasture and rangeland weed species. Effective weed management requires an understanding of weed ecology and control technologies that can be used within beef farming systems. MLA has a Weeds Investment Strategy that focuses R&D and extension efforts on providing new knowledge and the tools required to effectively control weeds of major national significance. Its delivery systems aim to provide producers with the skills, knowledge, understanding and tools to confidently control these weeds that affect production and costs.

Soil

The key land issue for beef production is the quality of soils, in terms of fertility relating to pasture and fodder growth. Soil degradation through erosion, salinity and acidity reduces fertility and plant growth. In cases of severe degradation, the land becomes unviable for agriculture.

Signposts addresses the issues of fertility in relation to nitrogen and phosphorus levels and degradation through dryland salinity and acidity.

Soil fertility is the result of the combined effects of three major interacting components: the chemical, physical and biological characteristics of the soil. Australian soils are generally shallow and infertile in terms of chemical and biological components.

In the southern beef region, producers generally improve their soils through the application of fertiliser, particularly nitrogen and phosphorus. The extensive nature of beef production in the northern beef region makes fertiliser application uneconomic; cattle are generally raised on native pastures often supplemented with phosphorus, nitrogen and other minerals.

Soil nitrogen (Norton and Srivastava 2007a)

Nitrogen is an important macronutrient in soil and essential to pasture growth and high yield. It is present in soils either as part of organic matter, which is unavailable for plant uptake, or in mineralised form (nitrate or ammonium ions), which is available to plants. In most soils, more than 95% of the nitrogen is present in organic form.

Available nitrogen is the component of total soil nitrogen that can be absorbed by plants. To become available for plant use, total nitrogen has to be converted to available nitrogen forms. This conversion occurs as microorganisms decompose the organic matter in soil.

Addition of mineral nitrogen fertiliser to beef pastures is limited to higher rainfall zones with high pasture and forage crop productivity, or to irrigated fodder crops and pastures. With rapidly increasing fertiliser prices, the use of nitrogenous fertiliser is becoming a more significant economic issue.

In areas of lower productivity, such as in rangelands, the nitrogen requirements of pastures may be managed through the inclusion of legumes such as subterranean clover or stylosanthes in the sward, or through seasonal feed supplements.

Summary measure

Signposts uses total soil nitrogen as an indicator of nitrogen in soils and has derived a summary measure, which is the proportion of land with total soil nitrogen above 0.1%. This is considered an acceptable level for Australian conditions since beef cattle are raised across a large range of soils, climatic zones and vegetation types. Generally, plant yield is positively correlated with total soil nitrogen (Black 1987).

Table 5 shows the area and proportion of total beef land with total soil nitrogen greater than 0.1% for National Action Plan (NAP)[3] regions. For all regions combined, the proportion is 56%. However, the proportion varies greatly, from 100% in the Goulburn–Broken region to only 17% in the Western Australian Northern Agricultural region. Regions where less than one-third of the beef production area has total soil nitrogen of greater than 0.1% include other regions in Western Australia (Ord, South Coast and Avon) and the Northern Territory region of Darwin–Katherine.

[3] National Action Plan for Salinity and Water Quality

Table 5 Area of land under beef production with total soil nitrogen greater than 0.1% in NAP regions

NAP region	Total area of beef land (ha)	Area of beef land with total nitrogen > 0.1% (ha)	Proportion of beef land with total nitrogen > 0.1%
Ord	4 544 300	1 219 900	0.27
Darwin–Katherine	4 689 000	904 300	0.19
Namoi–Gwydir	4 466 100	3 943 500	0.88
Mt Lofty–Kangaroo Island–Northern Agricultural District	1 636 800	1 310 900	0.80
South East	1 605 400	1 432 500	0.89
Avoca–Loddon–Campaspe	1 722 800	1 660 500	0.96
Goulburn–Broken	1 381 900	1 379 400	1.00
Glenelg–Hopkins–Corangamite	2 776 400	2 733 800	0.98
Murray	2 139 900	1 745 600	0.82
Lachlan–Murrumbidgee	11 280 300	8 118 200	0.72
Macquarie–Castlereagh	7 210 100	4 498 300	0.62
Border Rivers	4 351 300	3 472 500	0.80
Lockyer–Burnett–Mary	3 715 300	3 014 600	0.81
Condamine–Balonne–Maranoa	13 629 800	4 969 400	0.36
Burdekin–Fitzroy	23 171 400	10 097 800	0.44
South Coast	1 874 600	548 700	0.29
South West	1 818 000	1 655 000	0.91
Avon	1 583 200	477 600	0.30
Northern Agricultural Region	1 804 900	312 800	0.17
Midlands	826 200	815 800	0.99
Mt Lofty–Kangaroo Island–Northern Agricultural District–Lower Murray	640 600	418 800	0.65
Lower Murray	4 786 000	1 837 200	0.38
All regions	**101 654 300**	**56 567 100**	**0.56**

NAP = National Action Plan for Salinity and Water Quality
Source: NLWRA (2001a)

The main environmental risk of nitrogenous fertiliser use is the eutrophication of rivers, lakes, reservoirs and coastal areas. Since nitrogen, particularly in its nitrate form, is highly soluble, it can easily be leached into groundwater in sandy soils or carried with runoff into surface water bodies after rain or irrigation. This may occur if nitrogen availability exceeds plant requirements, but losses also depend on factors such as soil type and pH, crop grown, type of fertiliser applied, temperature and degree of soil cover.

Farmers can manage the risk of nitrogen runoff or leaching by soil testing and applying fertilisers that match the plants' needs during their life cycle. Some nitrogen, particularly from animal manure, surface application of urea or use of urea on alkaline soils, is lost to the air through volatilisation of ammonia, a contributor to acidification, or as nitrous oxide, a powerful GHG (NLWRA 2001).

Soil phosphorus (Norton and Srivastava 2007b)

Like soil nitrogen, phosphorus is a macronutrient that is critical to pasture yields and quality. Australian soils have a relatively low level of naturally occurring phosphorus, but the element can be added through phosphate fertiliser to increase the productive capacity of the soil. However, only a small proportion (1–4%) of total phosphorus is accessible to plants, and its availability is highly dependent on soil pH.

The majority of soil phosphorus exists in three general groups of compounds: organic phosphorus, calcium-bound inorganic phosphorus, and iron- or aluminium-bound inorganic phosphorus. Most of the compounds in these groups have very low solubility and are not readily available for plant uptake. Phosphorus in soil is usually available to plants as inorganic phosphate ions and sometimes as soluble organic phosphorus.

Table 6 provides information by NAP regions on levels of soil phosphorus. It shows considerable variation between the regions. Overall, 67% of beef farming land has soils with total phosphorus greater than 0.02%. The Western Australian regions of South Coast, South West, Northern Agricultural and Avon, as well as the South Australian South East region all have less than 10% of beef land with total phosphorus above 0.02%.

Summary measure

Signposts uses the level of phosphorus in the topsoil as an indicator of the available phosphorus, and the proportion of land with total soil phosphorus above 0.02% as the summary measure of the phosphorus 'health' of beef farmland soils. The Audit (NLWRA 2001a) defines 0.02% as a medium to high level of total soil phosphorus.

Table 6 Area of land under beef production with total soil phosphorus greater than 0.02% in NAP regions

NAP region	Total area of beef land (ha)	Area of beef land with total phosphorus > 0.02%	Proportion of beef land with total phosphorus > 0.02%
Ord	4 544 300	2 377 500	0.52
Darwin–Katherine	4 689 000	2 763 000	0.59
Namoi–Gwydir	4 466 100	4 322 900	0.97
Mt Lofty–Kangaroo Island–Northern Agricultural District	1 636 800	354 500	0.22
South East	1 605 400	137 500	0.09
Avoca–Loddon–Campaspe	1 722 800	650 300	0.38
Goulburn–Broken	1 381 900	877 600	0.64
Glenelg–Hopkins–Corangamite	2 776 400	2 119 400	0.76
Murray	2 139 900	780 800	0.36
Lachlan–Murrumbidgee	11 280 300	4 918 400	0.44
Macquarie–Castlereagh	7 210 100	5 945 900	0.82
Border Rivers	4 351 300	4 264 500	0.98
Lockyer–Burnett–Mary	3 715 300	3 429 100	0.92
Condamine–Balonne–Maranoa	13 629 800	12 596 700	0.92
Burdekin–Fitzroy	23 171 400	20 990 500	0.91
South Coast	1 874 600	41 400	0.02
South West	1 818 000	50 000	0.03
Avon	1 583 200	26 500	0.02
Northern Agricultural Region	1 804 900	39 100	0.02
Midlands	826 200	627 500	0.76
Mt Lofty–Kangaroo Island–Northern Agricultural District–Lower Murray	640 600	325 400	0.51
Lower Murray	4 786 000	726 400	0.15
All regions	**101 654 300**	**68 364 900**	**0.67**

ha = hectare; NAP = National Action Plan for Salinity and Water Quality
Source: NLWRA (2001a)

While phosphorus in the form of phosphate is not as soluble as nitrate, there are environmental concerns with phosphorus that relate to runoff in soil sediment and the eutrophication of water bodies. Farmers manage this risk by soil testing and applying fertilisers that match the plants' needs during their life cycle.

Soil salinity (Whitworth et al 2007a)

Salts are distributed widely across Australian landscapes. However, dryland salinity as a natural resource management issue occurs when soils and vegetation are degraded by the discharge of saline groundwater. This commences when the watertable reaches within two metres of the ground surface (National NRM M&E Framework 2004).

Australia's natural salinity has been exacerbated by clearing of large areas and replacement of the native vegetation with shallow-rooting crops that do not use as much water. This has meant that water from rainfall has entered the watertable, causing it to rise and mobilise salt, which then rises to the land surface. Once watertables are near the surface, salt stored in the soil or groundwater may be concentrated through transpiration by plants and evaporation. If this occurs in the root zone, it can affect plant production (NLWRA 2001b).

The Signposts indicator of soil salinity is the area identified as not at 'high salinity risk or hazard'. These areas were determined for the year 2000 using assessments of groundwater levels and trends, groundwater salinity and salinity outbreaks. Where data were not available, the key drivers of salinity, such as geological features, land use and climate, were used to determine high risk or hazard areas (NLWRA 2001b).

Summary measure

The Signposts indicator of soil salinity is the area identified as not at 'high salinity risk or hazard'. These areas were determined for the year 2000 using assessments of groundwater levels and trends, groundwater salinity and salinity outbreaks. Where data were not available, the key drivers of salinity, such as geological features, land use and climate, were used to determine high risk or hazard areas (NLWRA 2001b).

Signposts' summary measure of the state of the beef industry's soil in relation to dryland salinity is the proportion of beef land that is not assessed as having a high salinity risk.

It is important to note that the indicator is based on an assessment of risk rather than an actual measurement of soil salinity. In 2000, assessments were also made for the risk of hazard salinity areas in 2020 and 2050 (NLWRA 2001b).

Table 7 shows the results by NAP regions. For all regions, 98% of beef farming land is not assessed as high salinity risk or hazard. Soil salinity poses the greatest risk in Western Australia, with smaller proportions of the beef areas not assessed as high salinity risk or hazard.

Table 7 Area of land under beef production that was assessed as 'high salinity risk or hazard' in NAP regions

NAP region	Total area under beef assessed as 'high salinity risk or hazard' (ha)	Total area under beef (ha)	Proportion of beef land not assessed as 'high salinity risk or hazard'
Namoi–Gwydir	1 862	6 838 100	1.00
Mt Lofty–Kangaroo Island–Northern Agricultural District	11 800	2 338 400	0.99
South East	74 000	1 892 800	0.96
Avoca–Loddon–Campaspe	77 500	2 499 300	0.97
Goulburn–Broken	66 000	1 892 800	0.97
Glenelg–Hopkins–Corangamite	125 200	3 480 000	0.96
Murray	6 678	3 291 800	1.00
Lachlan–Murrumbidgee	48 426	14 805 800	1.00
Macquarie–Castlereagh	44 156	9 166 600	1.00
Border Rivers	994	6 224 800	1.00
South Coast	339 600	2 862 900	0.88
South West	322 100	2 123 500	0.85
Avon	397 500	1 91 2100	0.79
Northern Agricultural Region	217 000	2 219 400	0.90
Midlands	25 850	960 300	0.97
Mt Lofty–Kangaroo Island–Northern Agricultural District–Lower Murray	400	729 700	1.00
Lower Murray	55 100	5 771 900	0.99
All regions	**1 814 166**	**112 338 400**	**0.98**

ha = hectare; NAP = National Action Plan for Salinity and Water Quality
Source: NLWRA (2001b)

Dryland salinity has been identified as a priority natural resource management (NRM) issue. The focus, based on hectares affected by salinity, will be the New South Wales catchments of Lachlan, Murrumbidgee and Namoi; the Victorian Corangamite catchment; and the Western Australian catchments of South Coast and Avon. The proposed indicators of progress will be management practices, including area under perennials and area of sown salt-tolerant species.

On-farm and regional management of dryland salinity focuses on the reduction of recharge and the management of discharge sites. This may be achieved by changes in land use and land management practices. For example, recharge may be managed by planting deep-rooted perennials and maintaining remnant vegetation in recharge zones. Maintaining live plant cover as much as possible by use of sod-seeding new pastures and minimum tillage may reduce discharge and the risk of dryland salinity. Salt-tolerant plants may be used in areas affected by salinity outbreaks.

Soil acidity (Whitworth et al 2007b)

Soil acidification (the accumulation of acid in the soil) is a natural process that may be accelerated by degraded perennial pastures, including native-based pastures invaded by annual pastures. Soil acidity affects the availability of nutrients and toxic elements (eg aluminium) in the soil, which can limit plant growth and resulting pasture or fodder yields.

Acidity is measured by topsoil pH; soils with a lower pH are more acidic. A neutral pH is 7, and each pH unit below 7 is 10 times more acidic. Conversely, soils with pH values above 7 become progressively more alkaline (NLWRA 2001b). Table 8 shows the results by NAP regions.

Summary measure

Signposts' summary measure for soil acidity is the proportion of land with topsoil pH above 5.5. This pH value was chosen because it represents a threshold level below which degradation of clay minerals will occur and affect soil fertility. A pH value of 5.5 is considered a suitable level of acidity for most crops. Highly alkaline soils (pH above 8.5) are also considered undesirable for plant growth.

Brahman cattle at a watering point provided with a water tank and a windmill. Near the Lynde Junction, Queensland (photo by Arthur Mostead 2006)

Table 8 Area of land under beef production with suitable pH levels in NAP regions

NAP region	Beef land with pH ≥ 5.5	Total beef area (ha)	Proportion of beef land with pH ≥ 5.5
Ord	846 000	4 544 300	0.19
Darwin–Katherine	917 700	4 689 000	0.20
Namoi–Gwydir	3 281 600	4 466 100	0.73
Mt Lofty–Kangaroo Island–Northern Agricultural District	1 636 000	1 636 800	1.00
South East	1 563 800	1 605 400	0.97
Avoca–Loddon–Campaspe	1 270 900	1 722 800	0.74
Goulburn-Broken	618 200	1 381 900	0.45
Glenelg–Hopkins–Corangamite	503 200	2 776 400	0.18
Murray	1 384 500	2 139 900	0.65
Lachlan–Murrumbidgee	6 118 700	11 280 300	0.54
Macquarie–Castlereagh	4 835 500	7 210 100	0.67
Border Rivers	3 517 900	4 351 300	0.81
Lockyer–Burnett–Mary	2 058 300	3 715 300	0.55
Condamine–Balonne–Maranoa	12 609 600	13 629 800	0.93
Burdekin–Fitzroy	20 407 100	23 171 400	0.88
South Coast	152 400	1 874 600	0.08
South West	78 700	1 818 000	0.04
Avon	153 300	1 583 200	0.10
Northern Agricultural Region	330 100	1 804 900	0.18
Midlands	1 500	826 200	0.00
Mt Lofty–Kangaroo Island–Northern Agricultural District–Lower Murray	622 300	640 600	0.97
Lower Murray	4 614 300	4 786 000	0.96
All regions	**67 521 600**	**101 654 300**	**0.66**

ha = hectare; NAP = National Action Plan for Salinity and Water Quality
Source: NLWRA (2001a)

The data in Table 8 indicate that soil acidity is an issue in around one-third of beef land in the NAP regions and is most pronounced in the Western Australian regions.

Soil acidification is largely an on-farm issue and can be managed by the application of lime, which raises the soil pH and improves yields, but adds to production costs. Increasing perennial pasture species is also a technique that MLA is promoting to manage acidification.

Severe soil acidity (ie a pH of less than 4.5) that is not treated can lead to long-term soil degradation such as erosion and permanent loss of fertility. It can also contribute to increased nitrate pollution of groundwater and reduced water quality.

Water

Water is a natural asset that is available for use by the industry. It is an essential component of the natural capacity of the industry to produce food and ecosystem services.

Water extraction and use (Norton 2007)

Water is essential for the survival and productivity of cattle. Most beef production systems rely on rainfall, but irrigated pasture and forage crops are also used, particularly for finishing cattle before turnoff and for feed for intensive lot feeding.

Total consumption of water by livestock (including beef and dairy cattle, sheep and other livestock) was 1035 GL in 2004–05 (ABS 2006). This represents 8% of total water consumed in agriculture in 2004–05.

Irrigation of pastures (other than for dairying) consumed 1928 GL of water in 2004–05, representing 16% of total agricultural water use.

The industry's use of water needs to be considered in terms of the output of the industry, which had an estimated GVP in 2006–07 of $7.99 billion (ABARE 2008).

MLA is currently undertaking a 2-year on-farm 'life cycle analysis' study that will provide accurate figures on the amount of water and energy used to produce a kilogram of beef.

MLA has also proposed a water management practice survey as a means of establishing baseline data for later analysis of water use efficiency in the industry. A range of management practices can improve water conservation and water use efficiency in the industry. They include capping bores, piping stock water supplies, modernising irrigation technology such as centre pivots and installing soil moisture monitoring and weather stations linked to controllers, and introducing lower-water-use pasture and fodder species.

Water quality (Whitworth and Norton 2007a)

Water quality refers to the chemical, physical and biological characteristics of water. These determine the suitability of water for particular purposes, such as stock watering and irrigation. Water quality also affects the biodiversity of aquatic ecosystems.

The beef industry can primarily affect surface water quality through:

- streambank erosion, trampling and excrement contamination of watercourses
- soil erosion
- nutrient runoff and leaching after fertilisation
- seepage from effluent holding ponds in intensive beef lot operations.

MLA has proposed a number of measures, including the adoption of management practices leading to modelled water quality impacts (eg for runoff, sediment load, turbidity, nutrient load and salinity). Catchments that would be the focus of MLA's water quality monitoring and communications activities include the Burdekin (Qld), Fitzroy (Qld), Murrumbidgee (NSW), Corangamite (Vic), South Coast (WA) and Bremer (Qld) catchments.

Case Study 2 The Burdekin Catchment

Overview

With an area of 130 000 km^2, the catchment of the Burdekin River in north Queensland is the second largest catchment emptying into the Great Barrier Reef lagoon. Careful management of nutrient and sediment runoff is essential to maintain water quality and health of the reef.

Burdekin graziers contribute to the estimated 90 million tonnes of sediment that shift from this catchment annually. This poses a threat to the reef and is a serious loss of soil and critical nutrients to Burdekin beef producers.

The Queensland Department of Primary Industries and Fisheries, CSIRO, and the Queensland Department of Natural Resources and Water have partnered to fund research, development and extension into quantifying and communicating the relationships between grazing, land condition, runoff and erosion. This investment has identified grazing management practices that can maintain groundcover, reduce runoff and minimise erosion while maintaining productivity.

Characteristics

A series of projects have been undertaken as part of this program. They include the following.

Regional patterns of erosion and sediment transport in the Burdekin River catchment

This large data collection and spatial modelling project found that surface erosion varies by three orders of magnitude across the catchment. It demonstrated that 95% of the sediment exported to the coast is generated from just 13% of the catchment area.

Only 16% of suspended sediment and 4% of bedload delivered to the river network in any year is exported from the river mouth. The rest is stored within floodplains, as sand and gravel deposits on the beds of streams, and in reservoirs. The high erosion risk areas are the subcatchments downstream of the Burdekin Falls dam, the Bowen River, and parts of the upper Burdekin catchment.

Sustainable grazing for a healthy Burdekin catchment

This subsequent and recently completed project has revised previous recommendations and shown:

- Recovery of poor-condition pastures dominated by Indian couch in poor seasons was possible with modest utilisation rates, wet season spelling and pasture budgeting. Recovery depends on the location, size and arrangement of individual patches, the presence of perennial, palatable and persistent tussocks, and the amount of bare ground within patches.
- Grazed poor-condition patches, riparian areas and sodic soils are at particular risk of accelerated degradation due to preferential grazing by cattle.
- Whole-of-wet-season rest (rather than just an early spell for 6–8 weeks) appears to be required to recover poor-condition paddocks in years of well below-average rainfall.
- There is a lag time, perhaps of some years, between changes in grazing practices and potential impacts on export of sediment from the river mouth.
- To minimise erosion and accelerate recovery of Indian couch pastures, at least 60% groundcover and 800–1000 kg/ha of pasture dry matter are required at the end of the dry season. For tussock grass pastures, at least 70% groundcover and 1000 kg/ha of dry matter are optimum.
- Hill slopes with large bare patches at their base had up to 10 times more runoff and 50 times more soil loss than similarly covered hill slopes without large bare patches at their base.
- Soil loss models predicted that improving hill slopes in poor condition by 20% towards average condition can almost halve runoff and soil loss.

Ecograze

This 8-year project found that maintaining groundcover at a minimum of 40% is essential for minimising losses of water, sediments and nutrients from the system and for maintaining effective cycling of water and nutrients. Land was maintained in good condition by continuous stocking at 25% utilisation or early wet season spelling followed by 50% utilisation. Recovery of pastures in poor condition was also achieved through continuous stocking at 25% utilisation or early wet season spelling followed by 50% utilisation.

Wambiana grazing trial

This long-term grazing trial near Charters Towers in north Queensland demonstrated that sustainable grazing management is essential for optimising medium- to long-term profit and coping with risk in the northern savannas.

Moderate stocking (8 ha/adult equivalent) and average annual utilisation rates of up to 25% in tropical savannas will maintain pasture condition, reduce runoff, improve individual live weight gain (LWG) and produce higher economic returns compared with heavy constant stocking (4 ha/adult equivalent).

Individual LWG per annum was consistently higher under moderate stocking than under heavy stocking (mean: 126 kg vs 95 kg). Total LWG per hectare per year was higher under heavy stocking than under moderate stocking (mean: 23 kg/ha vs 15 kg/ha), but required costly drought feeding in the last 3 years.

Heavy stocking performed well in early good seasons, but due to declining pasture condition, increasing runoff, reduced carrying capacity, poor LWG and high costs was neither sustainable nor profitable in the long term.

Remotely sensed estimates of groundcover and biomass/feed availability in tropical savanna system

This project evaluated the capability of MODIS (Moderate Resolution Imaging Spectroradiometer) imagery for providing frequent and useful information on pasture cover and biomass at paddock to property scales. A MODIS bare ground index (ModBGI) was derived that can be used in conjunction with site-specific field measurements to derive estimates of groundcover, pasture condition and trend across large, diverse ecosystems. The project was also able to define statistical relationships between field measurements of pasture biomass and MODIS, but only after an effective means of standardising a time series of MODIS data was identified. MODIS has potential to provide government agencies and producers in the Burdekin catchment with spatially explicit, accurate information about land condition in near real time.

Who is involved?

Grazing Land Management

Grazing Land Management (GLM) is one of the training courses of MLA's EDGEnetwork. GLM is a 3-day workshop that has been developed to provide the best available information on land management (including the results of the above research) in an integrated manner.

More than 700 participants have completed a GLM course. Topics covered in the course include the calculation of short- and long-term safe stocking rates, use of fire, and control of weeds.

Benefits and beneficiaries

Producers are more aware of the downstream impacts of grazing, and more willing to modify management practices for productivity and environmental benefit. Findings from the studies have also assisted with prioritising of local environmental projects. Findings are being delivered to producers through the GLM training module of EDGEnetwork.

MLA surveys have found that 34% of north Queensland producers were aware of Ecograze, and that 48% and 52%, respectively, considered above-ground biomass and seasonal climate forecasts when adjusting their stocking rates. MLA considers that producers in the region are more confident that management practices are available that will help ensure the future of beef production in the Burdekin catchment. MLA believes improved management practices have resulted in less soil erosion and less degradation of local waterways and the Great Barrier Reef.

Natural capacity of beef farming lands to provide ecosystem services

There are many aspects to the capacity of an industry to provide ecosystem services, and this is a developing area that requires further research and knowledge. Markets are starting to be developed that, over time, may be attractive for beef producers. Key issues are the contribution of the industry to the conservation of biodiversity and GHG emissions (or conversely carbon sequestration).

Biodiversity and remnant vegetation conservation

This relates to the capacity of land held by the industry to conserve native biodiversity. It is an issue of national and state consideration, which is reflected in the *National Strategy for the Conservation of Australia's Biological Diversity* (DEST 1996) and at state level through laws and regulations that include controls on land clearing.

The National Strategy aims to 'protect and restore native vegetation and terrestrial ecosystems'. An objective that relates directly to agriculture is to 'achieve the conservation of biological diversity through the adoption of ecologically sustainable agricultural and pastoral management practices'.

Signposts currently relies on the availability of data derived primarily from the National Land & Water Resources Audit and hence depends on the continuation of this program.

Conclusion on biodiversity and remnant vegetation

From the industry's perspective, biodiversity is identified by MLA as a priority NRM issue for the red meat industry. MLA notes that it is currently working in the area, but only has qualitative indicators of progress.

Beef producers have responded to the challenge of biodiversity conservation by:

- taking areas out of production and revegetating them
- fencing remnant and revegetated areas to exclude stock and feral animals
- planting windbreaks to protect crops and provide shelter for native fauna.

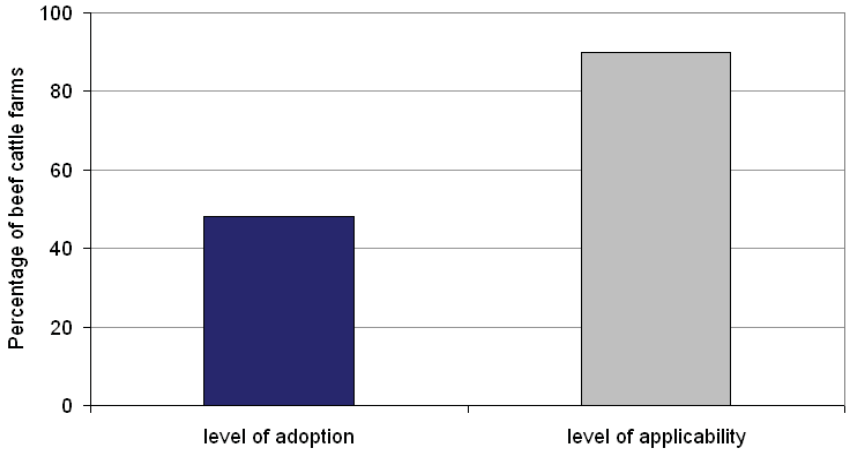
The Grain & Graze Program (Case study 4) is quantifying the impacts of various combinations of grazing management and crop/pasture rotation on biodiversity at 43 sites in the Murray-Darling Basin.

Summary measure

Signposts uses the proportion of beef cattle farms maintaining areas of conservation value as an indicator of biodiversity conservation. Its summary measure is the number of beef cattle farms maintaining areas of conservation value on their property as a proportion of beef cattle farms that can potentially maintain areas of conservation value on their property.

The results from the National Land & Water Resources Audit in 1999 (NLWRA 2001a) show that 'maintaining areas of conservation significance' is applicable to about 90% of the surveyed beef cattle farms, and the practice is being adopted on about 50% of farms (Figure 6). Based on these data, the summary measure is 0.53.

Figure 6 The applicability and adoption of 'maintaining areas of conservation significance' for beef cattle farms, 1999



Source: NLWRA (2001a)

Greenhouse gas emissions/carbon sequestration

Signposts addresses the issue of the GHG emissions of the beef industry as an environmental impact extending beyond the industry.

According to Lizzio and Whitworth (2007), sources of GHGs in agriculture that are relevant to the beef industry include methane from cattle digesting feed (enteric fermentation), nitrous oxide from soils, and carbon dioxide from use of fossil fuels to operate machinery. Other sources of GHG emissions from beef production are savanna burning in northern Australia, managed manure (methane and nitrous oxide emissions from manure in feedlot production), and changes in land use such as clearing. Land clearing results in net emissions of carbon dioxide, primarily due to decay or burning of woody vegetation.

As the largest proportion of GHGs from agriculture comes from enteric fermentation, the beef industry contributes a substantial amount of the GHGs from the agricultural sector. Methane and nitrous oxide emitted from agriculture are very powerful GHGs compared with carbon dioxide, in terms of the contribution to global warming over a set time period of each tonne of gas added to the atmosphere.

Signposts' presentation of data from the Australian Greenhouse Gas Emissions Information System (Australian Greenhouse Office 2007) shows that gross emissions from enteric fermentation, managed manure and agricultural soils in 2005 were 41.89 million tonnes of CO_2 equivalents, which was approximately 47.5% of total agricultural gross emissions.

Signposts' indicator

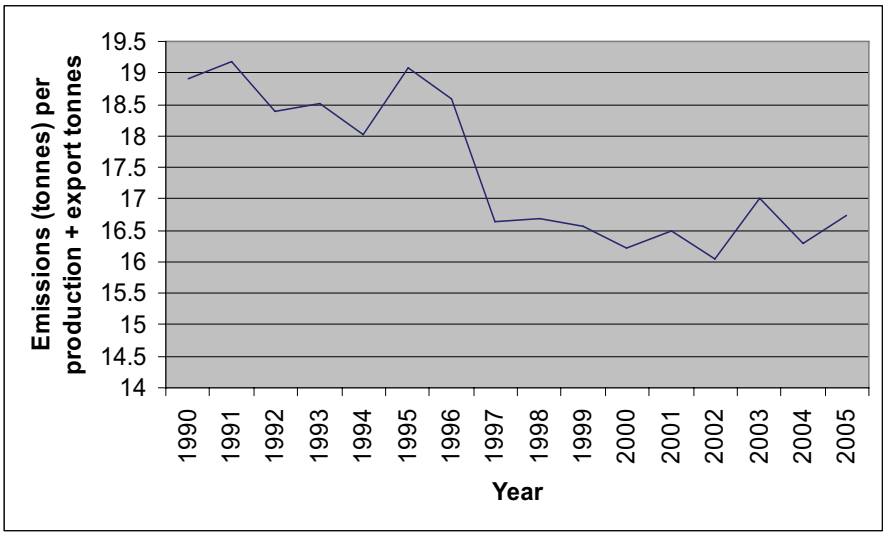
The indicator of GHG emissions is gigagrams of CO_2equivalents from enteric fermentation, managed manure and agricultural soils. Excluded from the indicator are savanna burning, energy consumption and land use change, due to the lack of data or difficulties in attributing the emissions solely to beef production.

An alternative indicator, currently not included in Signposts, is tonnes of GHG emissions per tonne of beef produced (including live exports).

Gross emissions were 13.5% higher in 2005 than in 1990, largely due to an increase in cattle numbers and increased use of feedlots. However, this is less than a 1% increase per year; during the same period, production increased by 25% in volume terms. This means that the GHG emissions per tonne of meat produced decreased over the period. Johnson (2008) states that the beef industry has reduced gross

emissions per tonne of production by more than 12% as a result of efficiency gains made since 1990 (Figure 7).

Figure 7 Beef emissions of greenhouse gases



Source: Meat & Livestock Australia (pers comm, 2008)

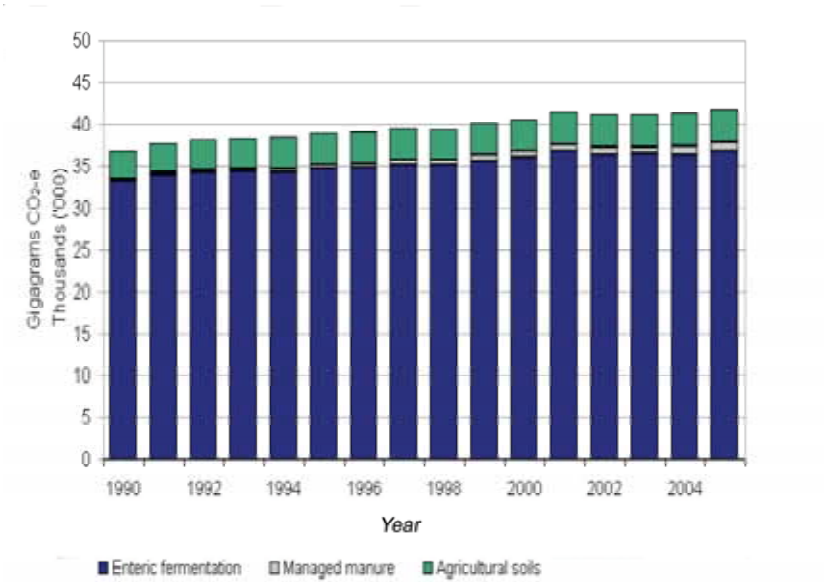
As shown in Figure 8, almost 88% of the beef industry's emissions were from enteric fermentation. MLA is looking to reduce methane gas emissions by using genetic selection to breed more feed-efficient cattle and developing rumen modifiers. MLA's research indicates that 'high feed efficiency cattle can produce 15% less methane and 17% less nitrous oxide per day than inefficient cattle'. MLA is also investing in research to understand differences in rumen metabolism between kangaroos (which do not produce methane) and cattle.

Another priority is to develop improved practices for managing solid waste in the feedlot and meat processing sectors. There are also plans for the Cooperative Research Centre for Genetic Beef Technologies to develop management strategies and commercial products that, by 2012, will be used by 50% of feedlots and 20% of grazing enterprises.

The main management actions to reduce GHG emissions in the beef industry are to increase the quality of feed for cattle through better pasture management and more grain finishing, and to increase production efficiency through higher turnoff weights at lower ages and improved weaning rates.

By ceasing broadscale land clearing, primarily for grazing, the industry has already made a major contribution to GHG mitigation since 1990, enabling Australia to be on track to meet its target under the Kyoto Protocol. The Australian Greenhouse Office estimated that the phasing out of broadscale tree clearing reduced Australia's net emissions by 76 million tonnes of CO_2 equivalents per year. These savings more than offset the total gross emissions attributed to the beef industry by the Australian Greenhouse Office in 2005 (Johnson 2008).

Figure 8 Estimated greenhouse gas emissions, by source, from the beef industry



CO_2e = CO_2 equivalents
Source: Australian Greenhouse Office (2007)

> In farming, a natural 'life cycle' is at play. While it is true agriculture is responsible for around 17% of Australia's total carbon emissions, no account has yet been taken of the carbon being sequestered in farm soils, crops and trees in this assessment. It needs to be. (NFF 2008)

GHGs may also be sequestered by agricultural industries. This refers to the GHGs that are being stored, or removed from the atmosphere. Signposts does not have any data on GHG sequestration resulting from management practices such as tree planting by beef producers. However, this is an area of growing prominence, with multiple environmental benefits, and appropriate data collection and studies are required, particularly to enable net emissions to be estimated at the enterprise level.

The National Farmers' Federation, in its submission to the Garnaut report on climate change policy, states that primary industry emissions have 'plummeted' by 40% over the past 15 years. They consider that the existing international greenhouse accounting rules fail to adequately recognise the full carbon balance in agricultural systems by taking account of emissions, but not sequestration.

Case Study 3 Enviromeat

Overview

The Age Good Food Guide 2008 recommends five Melbourne restaurants as the city's best steak venues, including 'Oyster Little Bourke', the only one located in the central business district. Oyster's chef Joe Vargetto uses a product called 'Enviromeat', which is chemical free and hormone free and is produced under rigorous animal welfare standards, backed up by an environmental management system (EMS) known as the Gippsland EMS.

Enviromeat is a success story of farmers who are earning a premium from a product that is branded as coming from an environmentally responsible production system.

In 1999, Gippsland beef and lamb farmers formed a beef marketing brand called Gippsland Natural, which sold grass-fed beef based on a quality assurance system. This was supported by a pilot project run through MLA that looked at whether international EMSs were applicable to Australian agriculture.

The majority of the participating farmers had already adopted sustainable farming practices. When they explored the EMS process, they believed there was an opportunity to underpin their brand with an environmental guarantee. The concept of Enviromeat was born.

Eight years after setting out on the path to sell meat backed up by a quality assurance program, 60 Gippsland farmers are now directly reaping the benefits. They are earning a 15% premium from their Enviromeat brand and educating consumers about the benefits of buying a product backed by a formal EMS that complies with the International Organization for Standardization ISO14001 environmental management standards.

At an individual restaurant level, diners may not realise they are part of a new wave of 'green consumers', but customers who buy Enviromeat from their local butchers and farmers' markets are deliberately making the choice of an environmentally sustainable product.

This important step is closing the loop between environmentally conscious consumers and producers who are implementing sustainable management practices.

Characteristics

During the development period of the project, the Gippsland EMS Producers Group worked for 3 years to raise awareness of EMS, encouraging and assisting producers to develop and implement an on-farm, auditable process. The group was keen to develop a whole-farm and catchment approach to help farmers minimise the environmental impacts of meat production, make good business and environmental decisions *and* produce a quality product.

The group believed that although an EMS was a valuable process for managing farms — such as in the area of identifying and managing environmental risks — at its minimum the EMS was still only meeting legislation. The producers believed that if they were using an EMS to underpin a brand, they needed to go significantly further. They began working with the West Gippsland Catchment Management Authority to add extra benchmarks to the EMS process, covering biodiversity, water quality and weed control. They then developed the centrepiece of the EMS — the Enviromeat product.

After some trial and error, the group developed the marketing slogan *Meat that tastes as nature intended*. When members realised that this was causing consumer confusion with organic certification, they differentiated their product by changing the marketing message to *Caring for land, water and wildlife*.

The Gippsland EMS, which has been implemented on participants' farms, is compliant with ISO14001 environmental management standards, as well as being compatible with both Cattlecare and Flockcare quality assurance programs. It provides an auditable, world-recognised system for managing environmental issues, including biodiversity, waste management, water quality, nutrient usage, energy outputs and erosion.

Who is involved?

Although Enviromeat is still being produced on a relatively small scale (by some 60 audited producers), it involves participants right through the supply chain, including producers, industry, government, retailers, restaurants and consumers.

Enviromeat has been driven by a small but committed and passionate team, originally drawn from the Gippsland Natural Beef Producers Alliance.

Support for the fairly onerous process of developing the EMS has come from a number of industry and government sources. MLA supported the first pilot project in 1999. In 2003, Gippsland Natural applied to the Department of Agriculture, Fisheries and Forestry national EMS pilot program, funded by the Natural Heritage Trust, to explore the EMS process further and bring more farmers into their program.

Enviromeat made its market debut at the Churchill Island farmers' markets. Then local stores became involved in trialling the product — notably Redina's Butcher in Balwyn, which also sells organic and

biodynamic meat. After 18 months of the trial, 40% of the meat on sale at Redina's was Enviromeat. Another supplier, Pie in the Sky, is now producing Enviropies using Enviromeat.

The Gippsland EMS Producers Group realised that, if the EMS project was to be sustainable in the Gippsland region, the group needed to build EMS capacity among producers. Three members of the project team have trained and qualified as EMS auditors. Landcare staff have been involved in the project to learn how to develop and implement an EMS for a farm business, and links have been made with auditors and staff from other EMS projects.

Enviromeat has just had a breakthrough into the international market, having signed a memorandum of understanding with the Government of Brunei to cooperate in supplying Enviromeat to the Brunei Halal Export Brand, which is based on authentic and ethical consumer values and aims to provide premium-quality Halal products for Muslim populations worldwide.

Benefits and beneficiaries

Although some farmers have fully adopted the EMS process to an audited standard, many other Gippsland producers have adopted some of the processes, improving the way they manage environmental resources — such as fencing off remnant vegetation and managing chemicals to minimise contamination risks.

A study of the self audits conducted in 2005 as part of the EMS process reveals that participating farmers' awareness of their environmental legislative requirements (such as chemical storage and weed control) has improved significantly as a result of implementing the EMS.

Farmers are also more aware of what they need to do to meet catchment targets for native vegetation cover and water quality. Many farmers are carrying out projects that have no direct economic return, such as fencing to protect remnant native vegetation.

Of the 27 farm enterprises in the Gippsland EMS in 2005:

- 58% were involved with the control and management of weeds such as blackberries and thistles and pest feral animals such as foxes.
- 42% fenced to exclude stock from waterways and gullies, either to prepare for planting, to reduce erosion or to improve water quality.
- 42% were in the process of revegetating parts of their properties with native species, mostly to restore native habitat in areas that were degraded or destroyed.
- 30% were fencing to protect remnant vegetation.
- 18% were acting to correct storage, management and handling of chemicals.
- 18% were carrying out a range of other environmental activities.
- 46% were preparing to carry out other environmental activities.

The project team and head office themselves have been externally audited four times by the compliance company SAI Global. This independent evaluation has resulted in significant improvements to the system, training and delivery of the Gippsland EMS. Also, project team members have been or are on the National EMS Advisory Group, Technical Committee for the Victorian Farmers Federation EMS Group, and Organising Committee for the National EMS Conference 2005.

The team has identified the following benefits of the EMS process and the development of Enviromeat:

- The project has strengthened the relationships between farmers and NRM agencies, and provided funding opportunities, leading to on-ground works being undertaken throughout the region.
- The group has been instrumental in the development of a series of easy-to-use, farmer-friendly booklets to help Victorian farmers understand their environmental legislative requirements.

- The willingness of group members to share their enthusiasm, experiences and knowledge regarding EMS is inspiring the broader community to consider EMS as a management and marketing tool, and as a means to achieve environmental change.

The processes that have been put in place by the group, including the training of personnel able to deliver and audit EMS, are providing the framework to extend EMS to more lamb and beef producers in Gippsland and to producers in the rest of Victoria.

The social contribution

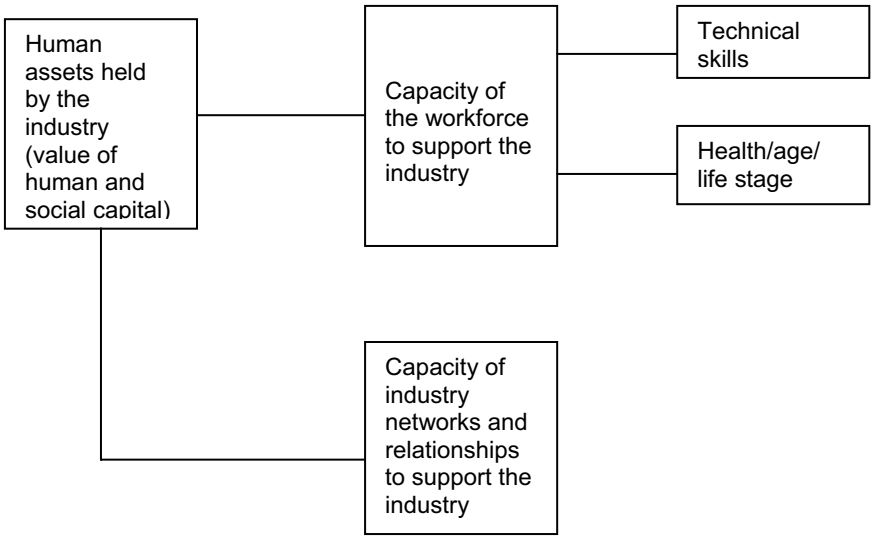
Signposts measures the social contribution of an industry in terms of its contribution to the development of human and social capital.

Figures 9 and 10 show in conceptual form the contributions the beef industry makes to social systems, thereby increasing or decreasing human and social capital (Chesson 2007).

Human capital

The industry's own stock of human capital is defined as the capacity of the industry's workforce (including producers) to support the industry. Attributes of the human capital component that will be measured by Signposts include technical skills and health, age and life stage of the work force.

Figure 9 Value of human and social capital held by the industry — Signposts' framework of the social contribution of the beef industry

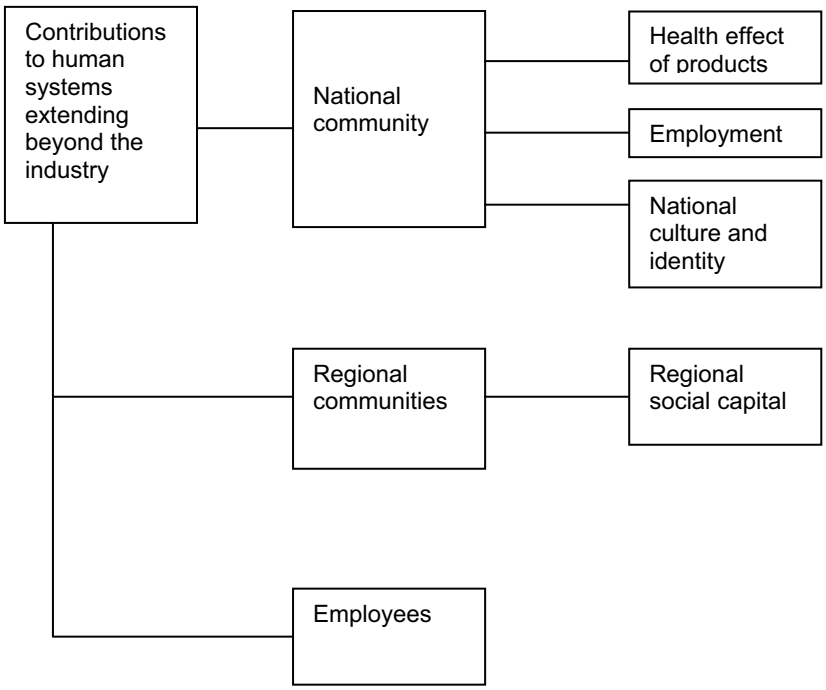


Social capital

The other aspect of the social contribution of the Australian beef industry relates to contributions extending beyond the industry itself, including contributions to the national community and regional communities (Figure 10).

Social capital is defined in terms of group relations, partnerships, norms and networks that facilitate diffusion of knowledge and innovation, provide support during structural adjustment and promote cooperative behaviour.

Figure 10 Contributions to human systems extending beyond the industry — Signposts' framework of the social contribution of the beef industry



National community

The contributions that the industry makes to social systems at the national scale include employment, the national culture and identity, human nutrition and the health of Australians.

Regional communities

Signposts notes that local and regional communities may receive many social flows from agricultural industries, via the development of unique cultures, businesses, production chains and communities related to an industry (Schirmer 2006).

Employees

This aspect of the profile includes contributions to individuals employed in the industry. It covers the economic benefits and impacts on health as well as less tangible components such as individual culture and identity.

This profile includes information on health costs and benefits, namely the extent of occupational injuries.

Employment

The employment component of Signposts measures the contribution of the industry to employment opportunities in local and regional communities. The desired outcome is for the industry to maintain or increase employment opportunities provided by the industry to local and regional communities (Whitworth 2007).

The beef industry accounts for a substantial proportion of all employment in the agriculture sector. In the 2001 census, 47 086 people were employed in beef cattle farming. This represented 22% of total agricultural employment, of which 16% related to specialist beef farms (DAFF 2005). In addition to specialist beef farms, 18 052 people were employed in sheep–beef cattle farming.

Signposts indicator

Signposts' indicator of the industry's employment contribution is the number of people employed in beef-related farming as a proportion of the total people employed. Employment in beef-related farming includes individuals who nominated themselves in the *Census of Population and Housing 2001* as being employed in the industries of 'beef cattle farming' or 'grain, sheep and beef farming undefined', for all Australian Bureau of Statistics 'occupation' types.

Farmers or farm managers constituted 70% of the 47 086 people employed by specialist beef farms. In the Northern Territory, most of those employed are agricultural workers or station hands, reflecting the extensive nature of the industry in the territory.

The distribution of on-farm employment in beef cattle farming by state (Table 9) shows that the greatest proportion of people employed in the beef industry were in Queensland (29%), followed by New South Wales (28%) and Victoria (17%). Regional employment is particularly important in northern Australia.

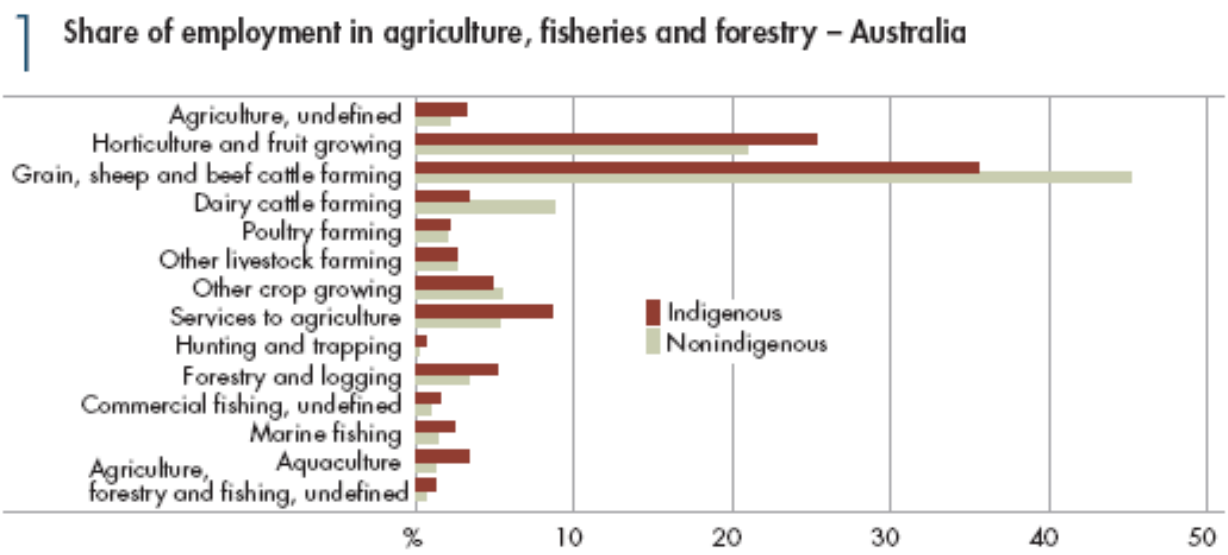
Table 9 Total number of people employed in beef cattle farming

State	Farmers or farm managers	Other employees	Total
New South Wales	9 987	3 371	13 358
Victoria	6 507	1 336	7 843
Queensland	11 774	6 575	18 349
South Australia	1 327	501	1 828
Western Australia	2 260	1 090	3 350
Tasmania	939	243	1 182
Northern Territory	279	825	1 104
Australian Capital Territory	48	24	72
Total	**33 121**	**13 965**	**47 086**

Source: ABS (2002)

The beef industry also provides employment for Indigenous Australians (Figure 11). In the 2001 census, 1477 people who responded said they were Indigenous and working in grain, sheep and beef cattle farming.

Figure 11 Share of employment in agriculture, fisheries and forestry for Indigenous and non-Indigenous Australians



Source: ABARE (2006)

Learning and training

Technical skills

The level of industry-related technical skills is considered to be one of the characteristics of the industry's workforce that is thought to influence capacity to make decisions, increase output, adapt to new situations and adopt new practices.

MLA itself provides a range of opportunities for learning, training and further education for producers, researchers, students and workers in the red meat industry. For producers, a key initiative is the EDGEnetwork. This provides a range of practical workshop sessions and learning opportunities, which help producers gain knowledge and develop skills to improve their livestock enterprises. Over the past 5–6 years, some 7500 beef producers have attended EDGEnetwork workshops.

MLA also provides Producer Initiated Research & Development support funding of up to $15 000 over 3 years for groups of producers to become actively involved in on-farm research and demonstration trials. Approximately 6000 producers are involved in these groups.

In addition, 11 000 producers are involved in 'More Beef from Pastures' activities, and an estimated 10 000 producers are involved in Grain & Graze, Evergraze and Sustainable Grazing on Saline Land activities.

Signposts indicator

The indicator of technical skills chosen by Signposts is the proportion of beef cattle producers who have attended training in recent years. This indicator was chosen on the basis that it best captures the preparedness of beef cattle producers for ongoing learning to improve business and resource management skills. A further indicator is the educational levels of producers.

Age, life stage and health

Health/age/life stage is also considered to be one of the characteristics of the industry's workforce that is thought to influence the capacity to make decisions, achieve growth in output, adapt to new situations and adopt new practices. An indicator considered by Signposts is the median age of farmers, which, monitored over time, may be indicative of the degree of new recruitment to the industry.

Health

Desired health outcomes

'Health' relates to the impact of the industry on the health of individuals involved in the industry. Signposts states that the most direct impact is through injuries on farms. Other potential impacts include long-term effects of working with chemicals and exposure to the sun, as well as the beneficial impacts of an active, outdoor lifestyle (Norton and Whitworth 2007).

At this stage of its development, data are only provided in Signposts for the number of 'occupational injuries'. Data specific to the beef industry are not available, so occupational injuries on grain, sheep and beef farms are used as the indicator. 'Occupational injuries' are employment injuries that are the result of a single traumatic event occurring while a person is on duty or during a recess period.

The desired outcome is that the negative impacts of the industry on the health of individuals involved in it are reduced.

Summary measure

Signposts uses a summary measure that shows the extent to which the desired outcome is being achieved on a scale of 0 to 1. A score of 1 for the most recent year means that occupational injuries are at their lowest level to date.

Figure 12 shows that performance has improved over the past 10 years. The summary measures are based on the indicator values from compensation statistics shown in Figure 13.

Figure 12 Summary measure for health

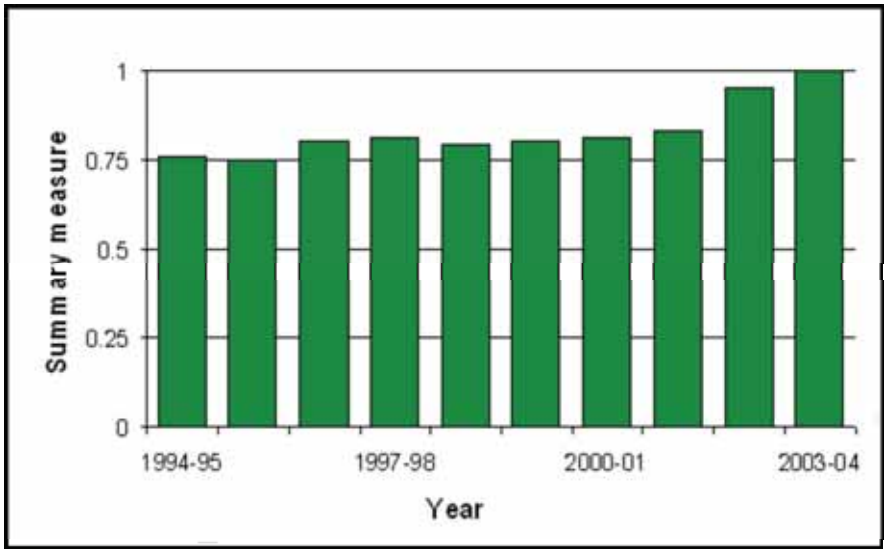
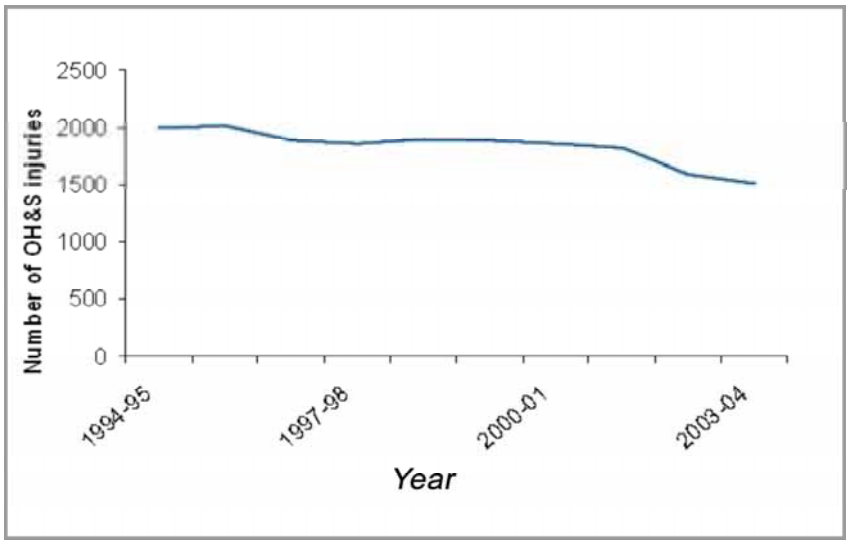


Figure 13 Number of reported occupational health and safety injuries on grain, sheep and beef farms (duration of a week or more)



Source: ASCC (2005)

Contribution to the nation's health

Beef production is a vital industry in Australia's food supply and food security, providing the main component of red meat demand. Australians consumed 36.3 kg of beef per person in 2006–07. Beef is the primary source for Australian consumers of high-quality protein and essential nutrients, including iron, zinc, vitamin B 12 and omega-3 fatty acids.

MLA gives high priority to informing Australian consumers about the nutritional value of red meat and to countering inaccurate information about certain foods and health that frequently arises in the media. It provides health professionals and consumers with evidence-based nutrition information on the role of red meat as part of a healthy diet, through nutrition research and education. The human nutrition research and development program provides scientific information and supports the MLA nutrition communication programs for consumers and health care professionals.

Contribution to the nation's social capital

The beef industry, its associated infrastructure, transport mechanisms and links to ports, and its network of policy, regulatory and market-based organisations, is a major contributor to the development of the economic and social structure of Australia. The industry is part of an extensive value chain from the farm gate to consumers. In addition, it has led to the creation of an extensive service sector. Producers participate in a wide range of industry and community organisations at local, regional, state and national levels.

MLA invests in a range of activities to build relationships and trust between the red meat industry and the community. Its *Annual Operating Plan 2007–08* has a program for Industry Integrity Communications that has the objective of maintaining high levels of community trust and pride in Australia's cattle industry.

The program's subobjectives are to build:

- awareness of the industry, its production practices, its science and technology
- opportunities for personal experience in the cattle production process through promotional activities
- empathy with the people behind Australia's cattle industry.

MLA tracks consumer trust through surveys and has found that the beef industry maintains high levels of support from consumers that it is trustworthy and ethical.

MLA (2007c) notes that 'with increasing loss of contact with agriculture by urban Australians, as well as greater focus on industry practices from animal rights and environmental groups, it is critical that the industry maintains these high levels of trust and pride'.

MLA undertakes a range of activities, such as celebrations of rural Australia, participation in city-based agricultural shows, provision of information and visits to schools, and opportunities for people to visit farms.

Snapshot — Farm Day

MLA supports the annual Farm Day initiative, when a farm family hosts a city family for a day of hands-on experiences in the day-to-day life of the farming family.

Farm Day aims to foster a greater understanding of farming among urban Australians through a farming family sharing their life with a city family for a day. The experience provides a chance to see how the modern farm operates, and how it affects the daily lives of urban families.

Case Study 4 Grain & Graze

Grain & Graze is a collaborative R&D and extension program across the grains and livestock grazing industries that seeks to enhance the economic, environmental and social contribution of the industries to rural communities and Australia.

Overview

For most of the 20th century, R&D programs in Australia took a compartmentalised approach. Many of them tended to focus on grains or meat or wool or natural resource management — without exploring how they overlapped and influenced each other.

Early this century, a number of factors came together to bring about a new R&D approach.

In 2000, the National Action Plan for Salinity and Water Quality (NAP) was adopted by Australian, state and territory governments. It committed them to jointly fund actions that tackled salinity and water quality in 21 highly affected regions across Australia.

For some years previously, MLA had been researching sustainable grazing systems, with a strong focus on high-rainfall areas and the northern part of the country. However, it had done little work in the medium-rainfall sheep and cereal zone of Australia.

Data collected by the NAP showed that salinity and acidification were major issues in the sheep cereal zone. With this zone emerging as an area of high production — and also high land and water degradation — it became obvious that it was a high priority for investment in triple-bottom-line production systems that would improve environmental outcomes alongside farm profitability.

At the time, MLA was one of four research and development corporations (RDCs) working separately with stakeholders in the sheep cereal regions. Many producers were paying levies to one of the corporations; some were paying as many as three.

MLA approached three other RDCs to propose joining forces for a holistic systems approach to practical research on mixed farms in the sheep cereal region. Australian Wool Innovation Limited, Land & Water Australia and the Grains Research and Development Corporation agreed to form a joint program called Grain & Graze. The program combined the knowledge and expertise of the four national partners with new on-farm research into a unique, Australian whole-farm approach.

Grain & Graze took a unique approach to building its research program. It divided the sheep cereal zone into nine regions. Each region was given funding to bring together key producer groups, government agencies and catchment management organisations and produce research proposals. Grain & Graze sent proposals back for fine tuning until each one took the desired holistic approach and was accepted for funding.

Around two-thirds of the Grain & Graze budget is dedicated to regional projects and another 15–20% to national projects. Grain & Graze is now the largest research and extension program of its type to offer Australia's mixed farmers the opportunity to increase their profitability, while better managing natural resources, including water, soil and biodiversity.

Characteristics

Grain & Graze set itself highly specific, production-oriented objectives. The program aims to raise awareness among 15 000 farmers and directly influence 6800 producers to change their mixed farming practices to deliver:

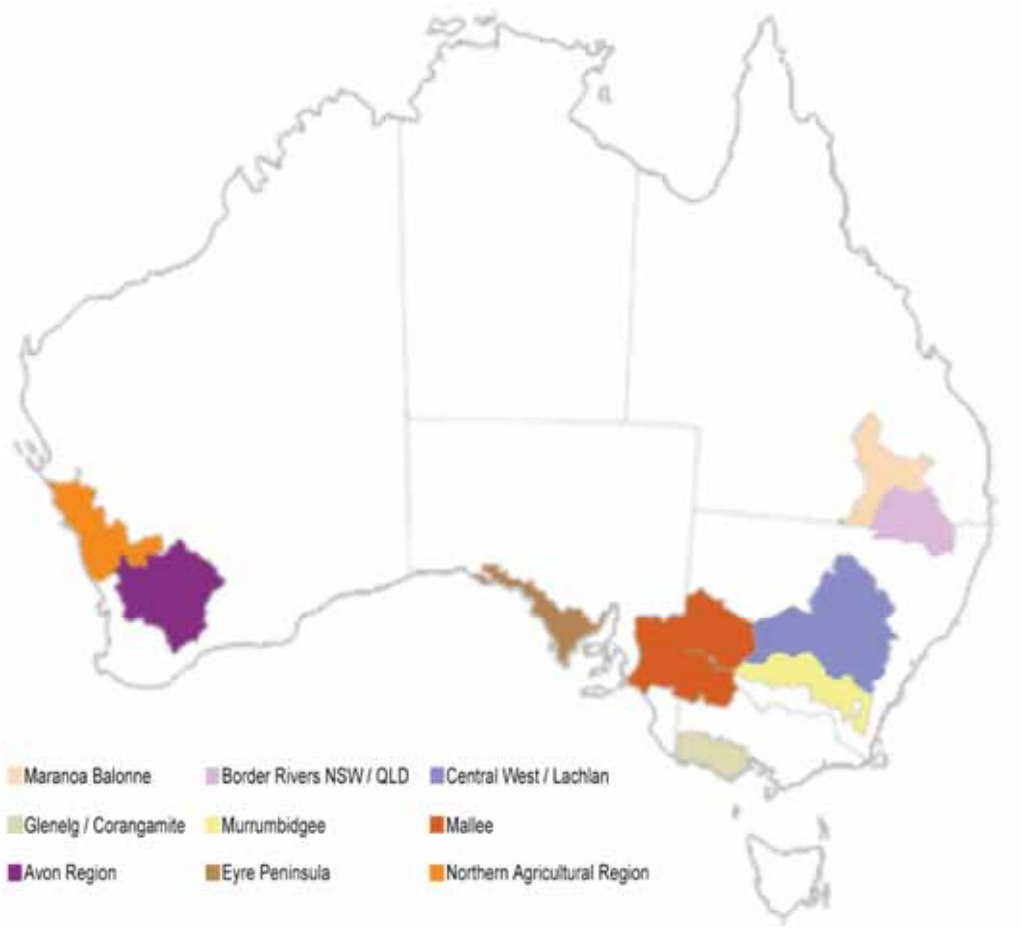
- a 10% increase in mixed farm profitability, driven by a 5% increase in grain yields and a 10% increase in livestock production
- improved, or at least stable, conditions for the natural resources on mixed farms, in line with regional or catchment targets
- confident and knowledgeable mixed farmers making decisions and using management tools that sustain production and promote biodiversity.

Grain & Graze engages participants in a learning model based on awareness, trialling ideas and refining these through adoption.

Figure 14 shows Grain & Graze locations throughout Australia.

A truck transporting hay, Victoria (photo by Alison Pouliot 2008)

Figure 14 Grain & Graze locations



Source: http://www.grainandgraze.com.au

Although they are diverse in climate, soils, rainfall, vegetation, population and the quality and type of products generated, the nine regions together comprise an important agricultural production zone.

The strength of Grain & Graze lies in its regional approach to innovation and extension. However, the program also looks across the regions to draw out principles about profitability, sustainability and social cohesion that remain constant.

It has developed four national projects:

- feedbase supply and demand
- whole-farm economics
- social considerations
- biodiversity.

These projects aim to increase the relevance, diversity and rigor of information that the program provides to producers.

Because Grain & Graze is dealing with whole-farm systems with triple-bottom-line goals, an important element of the national projects is that they work together. For example, it is not possible to think of feedbase utilisation without considering economic and biodiversity implications. Likewise, it is not possible to divorce economic and social considerations. This systemic approach is a vital part of Grain & Graze's philosophy.

Who is involved?

Grain & Graze's nine regions take in 13 catchment management authorities, a large number of producer and landcare groups and other major research providers, such as CSIRO.

Many thousands of producers are actively engaged in Grain & Graze. They are involved in more than 100 research and demonstration sites across Australia. Most of these sites are based on commercial farms and address relationships between cropping, pastures, animals and natural resources. Forty-three farms are involved specifically in an on-farm biodiversity study, the biggest of its kind in Australia.

Along with the four partner RDCs that comprise Grain & Graze, more than 65 organisations and agencies support the program and its participating producers. These agencies have interests across industry, catchment, farming and government and provide the breadth of expertise to address the production, environmental and social demands made of Grain & Graze.

Benefits and beneficiaries

The current phase of the Grain & Graze program comes to an end in mid-2008. Evaluation activities are well under way, as are plans for future RDC collaborative investment in mixed farming. The Grain & Graze evaluation project is helping the nine regions prepare evaluation plans. Some 1000 people will be interviewed in depth about the program, and other survey techniques will draw in broader feedback.

Ongoing tracking and activity studies have kept Grain & Graze in touch with the impacts of the program.

One finding is already clear: a synthesis of overall research suggests that mixed farming can take enormous pressure off annual-based cropping systems from an NRM perspective, while reducing climate risk and price risk, depending on the management regimes.

It is also clear that Grain & Graze brings about change. AgScan quarterly telephone surveys are used to track awareness and use of the Grain & Graze program by rural producers. The most recent study (July 2007) found that the Grain & Graze program leads to positive behavioural change, with 44% of respondents who had been to a Grain & Graze event having changed farming practices as a result of Grain & Graze activities.

Grain & Graze has created new knowledge. For example, profitable winter wheat grazing systems and integrated pest management systems have been refined to the point where adoption is occurring. The program has identified the social and economic drivers and constraints to improved mixed farming practices across the nine Grain & Graze regions. Guides to annual and perennial pastures have been completed in some regions.

Grain & Graze has developed specific regional success indicators, each relating to the goal of a 10% improvement in profitability on participating farms.

For example, in the Northern Agricultural region, success factors include increased sowing of subtropical perennial grasses, increase in grazing cereals, and better matching of feed supply and demand, and species to soil type, to increase profitability.

In the Avon region, success will see increased adoption of condition scoring, deferred grazing, better management and utilisation of pastures, and more producers able to translate gross margin for sheep on a per hectare basis. These changes will lead to increased seasonally adjusted stocking rates, extended pasture phases (high performance pastures) and improved strategic and tactical management (risk, time, quality of life).

These specific regional success indicators cover the production and environmental elements of the Grain & Graze triple-bottom-line goal. There are additional generic indicators for all regions that cover the social aspect of the triple-bottom-line goal. They include items such as increased appreciation of the value of biodiversity, improvement in farmer confidence, improved grazing management practices and improved water use efficiency.

The process of change is more complex than simply doing different research relevant to different regions. The local way of setting priorities, the way research is undertaken and the ongoing engagement of stakeholders are as critical as the content of the research itself.

Grain & Graze aims to motivate at least 6800 farm businesses to make changes on their properties that will see them become more profitable, sustainable and socially rewarded. Application of a cohesive framework for supporting change on-farm will make Grain & Graze results more likely to be adopted. This framework is the National Change on-Farm Strategy, which incorporates training, mentoring and exchange, communication, group facilitation and empowerment, technology development (incorporating best-practice guides) and national extension coordination.

The responsibility for implementing these activities is shared between those in the regions, the program partners and the program itself. The strategy targets those who seek to make change, as well as those who support and influence change. It takes into account the different experiences of Australia's farmers and the different ways in which they prefer to learn and do business.

A program as large and complex as Grain & Graze is an experiment in its own right. Since it began in 2003, people participating at all levels of the program have been part of a learning community, gaining insights into how to build complex partnerships and work across diverse cultures. The keys to success are shared objectives, constant communication, and the willingness to take alternative perspectives into account.

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About the Signposts for Australian Agriculture Report Series

The *Signposts for Australian Agriculture* project is a partnership between the Department of Agriculture, Fisheries and Forestry, Research and Development Corporations, and the National Land & Water Resources Audit.

The Signposts project aims to inform policy development by assessing and reporting on the environmental, economic and social contributions of Australian agricultural industries.

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