

# National Sheepmeat Production RD&E Strategy

January 2010



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# Acknowledgments

The National Sheepmeat Production Research, Development and Extension Strategy was developed under the auspices of the Primary Industries Standing Committee, Research and Development Subcommittee on behalf of the Primary Industries Ministerial Council.

Development of the National Sheepmeat Production Research, Development and Extension Strategy has been led by staff from Industry & Investment NSW together with Meat & Livestock Australia, working with members of the Red Meat Co-investment Committee.

Content has been developed with contributions from:

- Australian Government Department of Agriculture, Fisheries and Forestry
- Charles Sturt University
- Commonwealth Scientific and Industrial Research Organisation
- Cooperative Research Centre for Sheep Industry Innovation
- Department of Agriculture and Food Western Australia
- Department of Employment, Economic Development and Innovation
- Department of Primary Industries Victoria
- Griffith University
- Industry & Investment NSW
- James Cook University
- La Trobe University
- Meat & Livestock Australia Limited
- Murdoch University
- Northern Territory Department of Resources
- Primary Industries and Resources South Australia
- Tasmanian Department of Primary Industries, Parks, Water and Environment
- Tasmanian Institute of Agricultural Research
- University of Adelaide
- University of Melbourne
- University of New England
- University of Queensland
- University of Southern Queensland
- University of Sydney
- University of Western Australia
- University of Tasmania
- producers and supply chain participants contributing to the RD&E prioritisation forums.

The assistance and guidance provided by the Sheepmeat Council of Australia and Southern Australia Beef Research Council in developing industry priorities for research, development and extension is acknowledged.

## The Red Meat Co-investment Committee

The Red Meat Co-investment Committee (RMCIC) had its origins in the combined Meat & Livestock Australia (MLA)–Departments of Primary Industries (DPIs) Co-investment Committee. The RMCIC was formed in 2005 to improve strategic alignment of production research, development and extension (RD&E) investments in the red meat industries.

In the same year, state ministers for primary industries and the Australian Government endorsed a National Primary Industries Research, Development and Extension Framework (National RD&E Framework) that sought to engender national collaboration across a range of agricultural industries by publicly funded RD&E agencies. MLA and the other rural Research and Development Corporations (RDCs) were asked to join this initiative in 2007.

These parallel processes resulted in the MLA–DPIs Co-investment Committee gaining responsibility for developing and implementing the strategies for both beef and sheepmeat production RD&E under the National RD&E Framework, with the committee subsequently augmented include representation from the:

- Commonwealth Scientific and Industrial Research Organisation
- Cooperative Research Centre for Beef Genetic Technologies
- Cooperative Research Centre for Sheep Industry Innovation
- Australian Government Department of Agriculture, Fisheries and Forestry
- member faculties of the Australian Council of Deans of Agriculture.

The MLA–DPIs Co-investment Committee was subsequently renamed the Red Meat Co-investment Committee in 2008 to reflect its expanded membership and responsibilities.

The broad national membership of the RMCIC ensures that the National Sheepmeat Production Research, Development and Extension Strategy (the Strategy) has strong links to Australia’s major publicly funded RD&E providers and, through MLA, to key industry decision makers with interests in RD&E.

The RMCIC will have an ongoing role in facilitating implementation of the Strategy and the operational interactions between its members. Its ultimate aim is to achieve better outcomes for industry from the available RD&E resources.

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## Abbreviations and acronyms

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ASRC	Australian Standard Research Classification
Beef CRC	Cooperative Research Centre for Beef Genetic Technologies
CD&E	communication, development and extension
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSU	Charles Sturt University
DAFWA	Department of Agriculture and Food Western Australia
DEEDI	Department of Employment, Economic Development & Innovation (Qld)
DPIs	departments of primary industries
DPIV	Department of Primary Industries Victoria
DREAM model	Dynamic Research Evaluation for Management model
FTE	full-time equivalent
I&I NSW	Industry and Investment NSW
JCU	James Cook University
MLA	Meat & Livestock Australia Limited
MISP	Meat Industry Strategic Plan
MWG	Modelling Working Group
NSW	New South Wales
NT	Northern Territory
NTDR	Northern Territory Department of Resources
PIMC	Primary Industries Ministerial Council
PIRSA	Department of Primary Industries and Resources of South Australia
PISC	Primary Industries Standing Committee
Qld	Queensland
RD&E	research, development and extension
RDC	Research and Development Corporation
RMAC	Red Meat Advisory Council Ltd
RMCIC	Red Meat Co-investment Committee
SA	South Australia
SABRC	Southern Australia Beef Research Council
SCA	Sheepmeat Council of Australia
Sheep CRC	Cooperative Research Centre for Sheep Industry Innovation
Tas	Tasmania
The Strategy	The Sheepmeat Production Research Development and Extension Strategy
TIAR	Tasmanian Institute of Agricultural Research
UQ	University of Queensland;
UNE	University of New England
USQ	University of Southern Queensland
UTAS	University of Tasmania
UWA	University of Western Australia
UWS	University of Western Sydney
vet	veterinary science
Vic	Victoria
WA	Western Australia



## Executive summary

The National Sheepmeat Production Research, Development and Extension Strategy (the Strategy) was developed at the request of the Australian Primary Industries Ministerial Council.

The lead agencies for developing the Strategy are Industry & Investment NSW (I&I NSW) and Meat & Livestock Australia (MLA). The leadership roles of both organisations were determined on the basis of the significant interests they oversee in sheepmeat production.

In developing the Strategy, I&I NSW and MLA have worked with all the other organisations represented on the Red Meat Co-investment Committee (RMCIC) to develop and collate information on the relative (industry) demand for, and (agency) supply of sheepmeat RD&E resources (including personnel and infrastructure) across Australia. The RMCIC has also overseen the development of principles and processes for identifying and reallocating RD&E resources in line with future investment priorities.

These priorities have been identified and developed in consultation with sheepmeat producers, supply-chain participants and the Sheepmeat Council of Australia (SCA). Collectively the consultation processes and entities have been involved in the development of:

- seven strategic imperatives that align with Australian Government, state and territory government priorities, and the RD&E priorities prescribed within the Meat Industry Strategic Plan 2010–2015
- proposed research, development and extension RD&E programs, and specific deliverables for further assessment and consideration by the RMCIC.

The Strategy has the support of the government agencies and CSIRO represented on the RMCIC. It describes the implementation of new processes to guide investment in the sheepmeat production research, development and extension sector in the future. These processes provide for collaborative approaches to:

- stakeholder assessment of investment priorities
- ex-ante investment analysis and ex-poste evaluation
- program development, initiation and management
- maintenance of critical infrastructure and intellectual property
- maintenance and development of human capacity.

The outcomes from implementing these new approaches to research, development and extension will be:

- better coordinated research, development and extension investment that aligns with industry and government priorities
- increased efficiency in resource use and retention of key resources and infrastructure
- development of, and succession planning for retaining key human resources to address current and future priorities
- identification, retention and national coordination of critical intellectual property in terms of research flocks, animal samples and databases.

The processes described in the Strategy provide new mechanisms for the government agencies, MLA, universities, CSIRO and the Cooperative Research Centre for Sheep

Industry Innovation (Sheep CRC) to share information and make collaborative investments on behalf of industry, government and RD&E providers.

Under the Strategy, the role of the Southern Australia Beef Research Council (SABRC) will be expanded to include oversight and consultation on sheepmeat RD&E priorities and programs, in addition to its current role within the beef industry. The link to beef production RD&E investment through the RMCIC will also ensure that appropriate resource and information sharing and co-investment occurs between these two red meat industries. Linkages with other sectoral and cross-sectoral plans have also been identified.

These investment processes are not directly relevant to the RD&E investment processes currently used in the sheepmeat processing and live-export sectors. Nevertheless, the intention is to develop the next version of the Strategy to encompass RD&E relevant to the whole sheepmeat supply chain.

# 1 Introduction

In 2005, the National Primary Industries Research, Development and Extension Framework (National RD&E Framework) was endorsed by the Australian Government, and all states and territories, supporting a model of national research, regional development and local extension for a range of industries and cross-sectoral themes. The National RD&E Framework recognised that basic and strategic research can be provided from a distance, along with regional adaptive development and local extension, to improve the rate of innovation by industry.

PIMC called for the National Sheepmeat Production Research, Development and Extension Strategy (the Strategy) to be developed for consideration in April 2010. I&I NSW have been allocated the lead role in this process. MLA is the supporting Research and Development Corporation. The development of the Strategy has been facilitated through the RMCIC whose membership includes MLA, state agencies, CSIRO, the Cooperative Research Centre for Beef Genetic Technologies (Beef CRC), the Sheep CRC and representatives of the university sector. The Sheepmeat Council of Australia has also been closely involved with the development of the Strategy.

The aims of the Strategy are to:

- improve the focus, efficiency and effectiveness of sheepmeat production RD&E across Australia, and reduce fragmentation and duplication of effort
- create a system of sheepmeat production RD&E that better integrates the priorities of industry and industry organisations, investors, federal, state and territory governments, CSIRO, the Sheep CRC, universities, and private providers for industry, stakeholder and community benefit
- enhance sheepmeat production RD&E capability through increased collaboration, specialisation and critical mass as appropriate, and generate greater national benefits from large infrastructure investments
- provide a sheepmeat production RD&E system that is supportive of, and responsive and accountable to, industry needs and delivers integrated and accelerated industry development.

This document provides a strategic framework and process plan for national collaboration by state, territory and Australian government departments, MLA, universities, CSIRO and the Sheep CRC in sheepmeat production RD&E. It sets out the process by which agencies and institutions with an interest in sheepmeat production RD&E will invest and work collaboratively in the future. This process will provide greater efficiency of resource use by:

- avoiding duplication of effort
- identifying and prioritising critical infrastructure required for sheepmeat production RD&E
- maintaining and nurturing human resource capability.

The Strategy further develops the principles for developing a National RD&E Framework set out in the Statement of Intent signed by all PIMC members and the Rural Research and Development Corporations (RDCs), namely:

- a) The Parties will cooperate to encourage the establishment of a more efficient and effective RD&E system nationally.
- b) Recognising that the Parties will be subject to budget fluctuations, the Parties will endeavour to at least maintain RD&E funding levels for primary industries; and

investments, including from savings, should be re-directed to improve the capability of primary industries RD&E in priority areas.

- c) The Parties will share information, plans and priorities for investment in RD&E to facilitate development and implementation of the Framework.
- d) The Parties will facilitate access to national research capability (people, infrastructure and information) by industry and R&D partners across Australia, including the private sector.
- e) The Parties will support processes to refresh the rural R&D priorities and to encourage more consistent and rigorous monitoring of performance of R&D targeting and delivery.
- f) The Parties recognise the importance of investing in extension of R&D to facilitate rapid uptake of research and innovation, and the increasing role of the private sector.
- g) The Parties agree to work cooperatively to improve the administrative processes and effectiveness of information sharing and management.
- h) The Parties agree to freely share the knowledge generated through the primary industries National RD&E Framework, including minimising barriers to RD&E created by intellectual property protection.
- i) The Parties will monitor, evaluate and report on the performance of the National RD&E Framework and the sector and cross-sector strategies developed and implemented under the Framework.

The Strategy has also been aligned with the relevant components of the Meat Industry Strategic Plan 2010–2015, released in October 2009, which contains the following strategic themes:

1. Environment and ethics  
*Promote ethical and responsible custodianship of the environment, animal welfare and resources used in the production of red meat.*
2. Market access  
*Maximise, in partnership with government, effective trade facilitation.*
3. Our industry  
*Promote a single coordinated voice for our industry to reshape and reinvigorate relationships within industry and with government.*
4. Our people  
*Develop and retain motivated and appropriately skilled people for our industry.*
5. Innovation  
*Increase competitiveness and profitability through innovation.*
6. Marketing and promotion  
*Focus on the consumer to continue to achieve profitable growth in demand for Australian red meat and livestock products.*
7. Economics and infrastructure  
*Foster economic reform and infrastructure investment to enhance the capabilities of our industry.*

Some work has been done to align this production sector plan with the processing and live-export sectors, but further efforts are required to complete this.

The Strategy will provide a mechanism for the sheepmeat industry to retain an effective and efficient RD&E capability. This will support the production sector to innovate and respond to the growing demand for sheepmeat, despite pressures on government budgets and human resources.

#### Meat Industry Strategic Plan 2010–2015

The Meat Industry Strategic Plan 2010–2015 (MISP) represents a single view of the Australian red meat and livestock industry and provides a high-level roadmap for RD&E, marketing and policy investments across the whole red meat supply chain for the period 2010–2015.

The plan was developed by the Red Meat Advisory Council Limited (RMAC), which has custodianship of the MISP planning and implementation process. RMAC comprises five of the six peak industry councils of the red meat and livestock industry:

- Australian Livestock Exporters Council
- Australian Lot Feeders' Association
- Australian Meat Industry Council
- Cattle Council of Australia
- Sheepmeat Council of Australia.

The Goat Industry Council of Australia, although involved in the red meat industry, is not a member of RMAC. The MISP is now into its third major iteration — the foundation plan (MISP 1) was developed by industry in 1996.



## 2 Situation analysis

This section provides an overview of the sheepmeat industry in Australia, including a background to the industry; industry and flock dynamics; production values and markets for sheepmeat; research, development and extension investment; and industry opportunities.

### 2.1 Background to the Australian sheepmeat industry

The Australian sheepmeat industry is vibrant and dynamic, with strong prospects in both domestic and international export markets. The industry has changed significantly from the early 1980s, when it suffered from poor perceptions of quality and value, limited marketing opportunities and low farm-gate prices.<sup>1</sup> The ‘fat’ lamb industry was stagnant and under serious threat of losing relevance, and was becoming a byproduct of the wool industry. In 1990, the sheepmeat industry was valued at \$1.1 billion and was primarily dependent on a weak domestic market.

To revitalise opportunities for the Australian sheepmeat industry, industry participants and stakeholders focused on three clear objectives:

- Reliance on the domestic market was decreased through the identification of export opportunities that allowed market growth. In the case of lamb, the market in the United States provided an opportunity with its declining national sheep flock and a growing segment of the population that were consumers of lamb.
- Perceptions of the quality of Australian lamb were shifted towards a product that had value, was convenient and contained less fat.
- On-farm and off-farm research and development were coordinated with specific marketing campaigns and promotions. This worked in harmony to provide supply opportunities based on consumer requirements and an industry strategic plan that focused on building supply chains.

The first industry strategic plan for the sheepmeat industry (the Lamb Industry Strategic Plan) was initiated in 1995 and had the vision of growing the value of the industry to \$2 billion by 2000. The successful elements of this plan included:

- a focus on the production of larger leaner lambs, using genetics and production systems to achieve a carcass weight of 24 kilograms
- a marketing campaign in the United States titled ‘Fresh Australian Range Lamb’
- a trim and elite lamb campaign to target domestic consumption and heavier carcass weights, respectively.

By end of the 1998–99 financial year, the sheepmeat industry had a total value of \$2.24 billion<sup>1</sup>. Importantly, carcass weights had increased to an average of 19.5 kilograms and the proportion of export value had lifted to 29 per cent.<sup>2</sup>

The second industry plan (2000–2005) shifted focus to the establishment of a culture of ‘prime’ lamb development. The target for the total value of the sheepmeat industry was

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<sup>1</sup> MLA (Meat & Livestock Australia) (2009). *Lamb survey results January 2009*, MLA, Canberra.  
CIE (Centre for International Economics) (2008). *An Evaluation of Lamb On-farm Programs and an Evaluation of Domestic and US Lamb Marketing*, CIE, Canberra.

<sup>2</sup> MLA (Meat & Livestock Australia) (2009). *Lamb survey results January 2009*, MLA, Canberra.

\$2.8 billion by 2005. More attention was paid to the continual improvement of specialist prime lamb producers who were servicing increasing demand from the United States. The acceptance of lamb and its change in characteristics, particularly those associated with improved leanness, led to a domestic marketing focus centred on the theme ‘we love our lamb’.

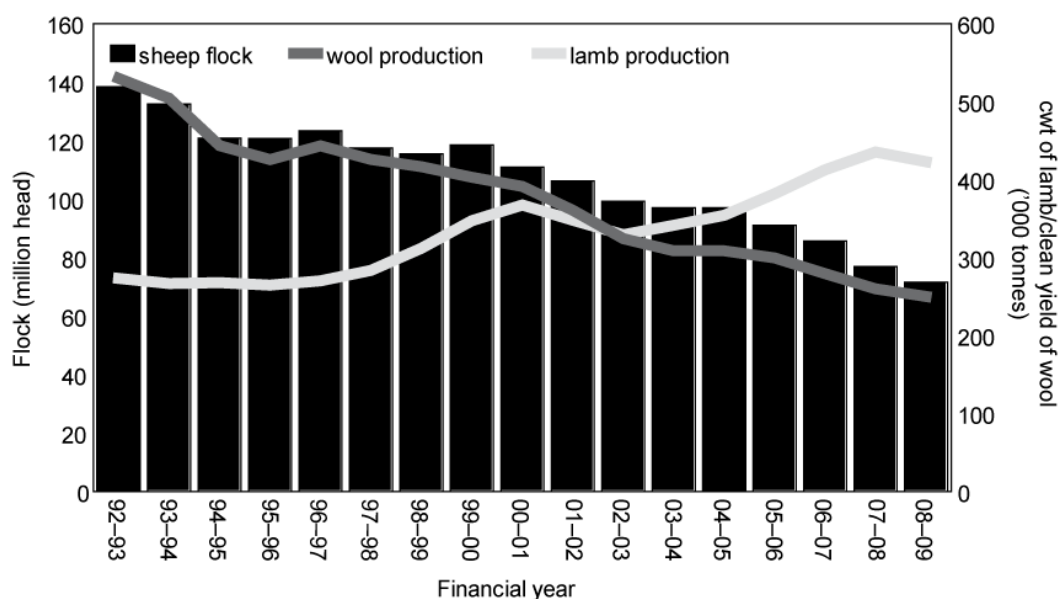
## 2.2 Current Australian sheepmeat industry

This section provides information on the current sheepmeat industry in Australia.

### 2.2.1 The flock and industry dynamics

The Australian sheep flock has contracted by 34 per cent over the last 10 years to approximately 71.6 million head (Figure 2.1). This is the smallest the Australian flock has been since 1905. The principal reasons for this rapid decline are:

- the strength of the lamb industry and the decline in the profitability of wool
- a series of poor drought years in traditional sheep growing areas
- an increase in the area of land used for cropping and a higher gross margin per hectare for cropping compared to livestock industries
- a shortage of labour to run sheep operations.



cwt = carcase weight  
Source: ABS<sup>3</sup>

Figure 2.1 Change in Australian sheep flock, and lamb and wool production (2009)

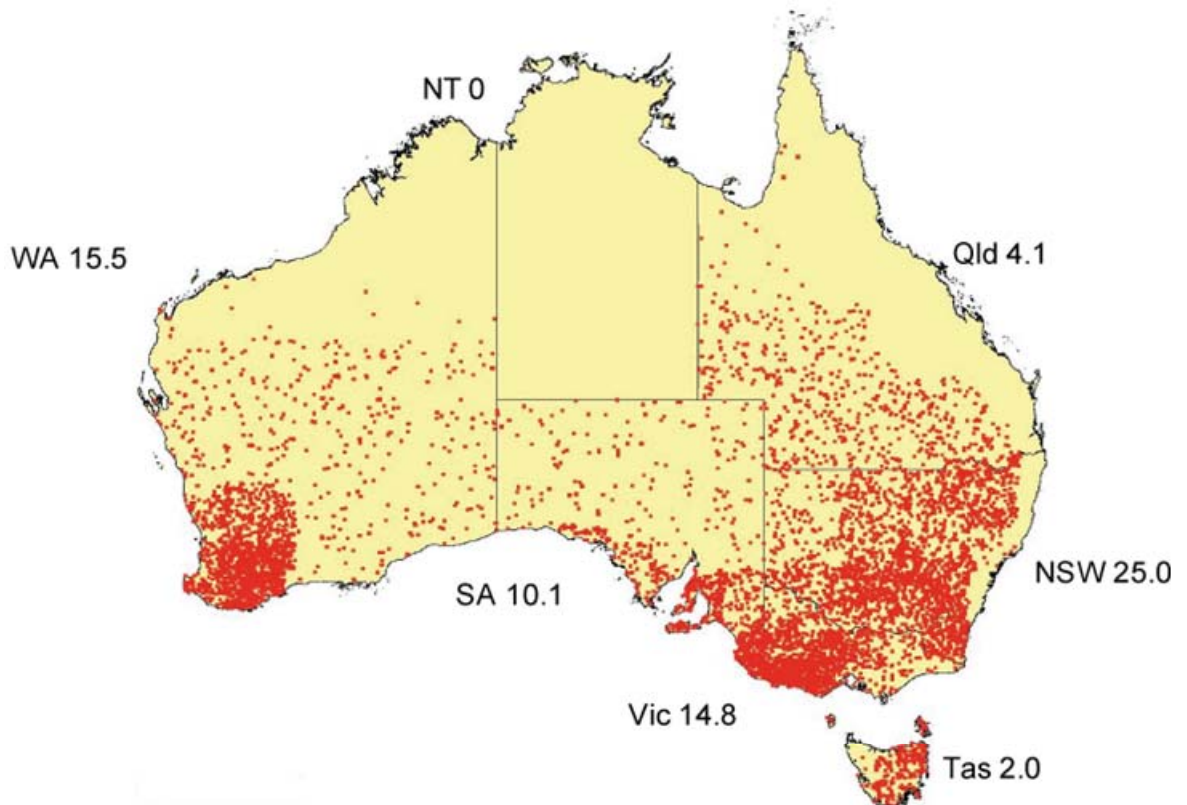
Based on Australian Bureau of Statistics (ABS) figures from 2008, approximately 31,433 producers are active participants in the Australian sheepmeat industry. Most of these

<sup>3</sup> ABS (Australian Bureau of Statistics) (2009). *Principal Agricultural Commodities, Australia, Preliminary, 2008-09*, cat. no. 7111.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2009). *Livestock and Meat, Australia*, cat. no. 7218.0.55.001, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2009). *Livestock Products, Australia*, cat. no. 7215.0, ABS, Canberra.

producers are in the wheat–sheep zones of New South Wales, northern Victoria and South Australia, and in the high-rainfall zones of New South Wales, southwest Victoria, southeast South Australia and southwest Western Australian (Figure 2.2). Given the distribution of sheep operations and the prevalence of mixed-enterprise businesses, strategic plans for the sheepmeat sector must also consider those of the beef, grain and wool sectors.



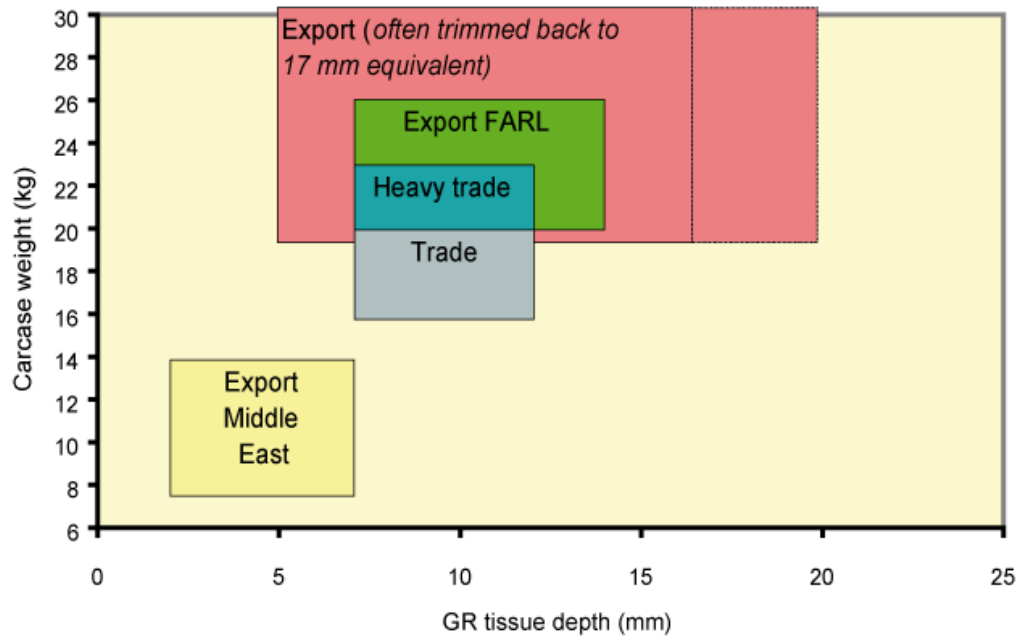
Source: Australian Bureau of Statistics<sup>4</sup>

Figure 2.2 Estimated population distribution of sheep in Australia (million head) (2008)

Lamb production systems vary across Australia. Due to the nature of the domestic and export markets, lamb production turn-off ranges from 12–30 kilograms (Figure 2.3). This diversity allows significant flexibility for marketing lamb worldwide.

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<sup>4</sup> ABS (Australian Bureau of Statistics) (2009). *Principal Agricultural Commodities, Australia, Preliminary, 2008–09*, cat. no. 7111.0, ABS, Canberra.



FARL = Fresh Australian Range Lamb; GR = grade rule; kg = kilograms; mm = millimetres;

Figure 2.3 Australian Lamb market specifications by carcass weight and GR score

Traditionally, prime lamb production was based on crossbreeding programs that used terminal  $\times$  first-cross ewe matings (second-cross lambs; 5.2 million) and these systems were centred in the higher rainfall regions. The increase in profitability of lamb has increased the number of terminal  $\times$  Merino matings (7.2 million) and thus the availability of these lambs for slaughter. In addition, the proportion of purebred Merino lambs (4.5 million) that are slaughtered has increased<sup>2</sup>. Other production systems, such as maternal  $\times$  Merino and dual purpose matings, are a minor component of production. Specialist finishing systems, including pastures and grain, have been developed to ensure that market specifications are met<sup>2</sup>.

Significant flock restructuring has occurred with the decline in sheep numbers. The proportion of ewes has increased significantly as a result of falling wether numbers. There has also been a significant shift from wool to lamb production (Figure 2.1), in conjunction with a shift from Merino  $\times$  Merino mating towards terminal  $\times$  Merino or maternal  $\times$  Merino matings, and an increasing number of Merino wether lambs being slaughtered before 12 months rather than being retained for wool production. These shifts in production have seen prime lamb supply increase (despite the drop in the national flock) by 24 per cent over the last 10 years and 7 per cent in the last year<sup>2</sup>.

However, lamb supply is under threat given current trends, as supply requires a breeding ewe-replacement strategy and a focus on management changes that improve productivity at the farm level, including:

- a reversal of the decline in ewe numbers
- a shift in the breed composition of the ewe flock towards ewes with greater maternal ability
- improved reproduction and survival rates
- a continual increase in carcass weight.

It is likely that the trend of increasing the ewe proportion in the national flock and increasing lamb production will continue. This has been positive in terms of building lamb supply to capture growing market opportunities, but it has impacted negatively on the supply of sheep for mutton production and stock available for live export.

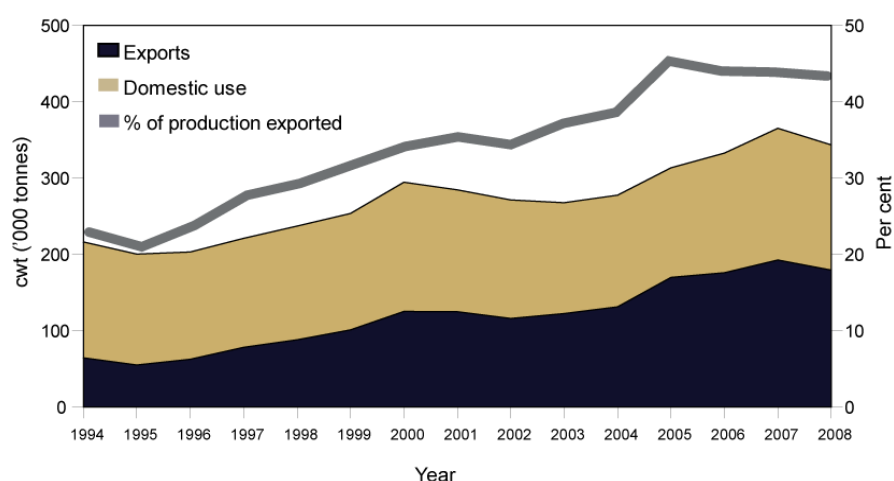
It is estimated that the area operated by farms running sheep is of the order of 134 million hectares, or 30 per cent of the agricultural landmass of Australia. For this reason, it is essential that strategic plans address the need for effective environmental management that meets community expectations for land management.

## 2.2.2 Lamb and sheepmeat production, value and markets

The Australian sheepmeat industry is now worth \$4.32 billion dollars. This represents a 93 per cent increase in total value since 1998–99 and reflects the success of the industry and its strategic planning. Lambs and sheep contributed around 6 per cent of total farm gross domestic product in 2008–09.

In 2008–09, Australia produced 423,000 tonnes of lamb and 235,300 tonnes of mutton. In 2008–09, Australia was the third-highest sheepmeat producer in the world, producing over 8 per cent of the total supply of sheepmeat (Food and Agriculture Organisation; 2008), with only China and the European Union exceeding Australian production.

The Australian lamb market has shifted significantly in terms of export and domestic production (Figure 2.4). Approximately 44 per cent of total lamb production in Australia (184,474 tonnes) was exported in 2008–09. This was valued at \$966 million dollars, which represents a 216 per cent increase over the last 10 years. Primary export markets include the United States, the Middle East, China, Japan and the European Union.



cwt = carcase weight

Source: Australian Bureau of Statistics, Australian Government Department of Agriculture, Fisheries and Forestry, and Meat & Livestock Australia estimates

Figure 2.4 Australian lamb for domestic and export markets (1994–2008)

On average, Australians have consumed 11.2 kilograms of lamb per person per year since 1994. However, importantly, domestic expenditure on lamb has increased to \$2.24 billion or 108 per cent over the last 10 years. This means that a focus on maintaining the quality of lamb must be a high priority — on a protein basis, lamb is now an expensive meat compared with beef and consumers will continue to demand quality.

Australia exports over 80 per cent of its mutton production, worth \$499 million in 2008–09. The reduction in sheep numbers is a significant threat to this market. Major mutton export markets include the Middle East, Southeast Asia, South Africa and the United

States. Domestically, although only 20 per cent of mutton is consumed (at an average of 2.1 kilograms per person per year), this market is still worth \$270 million annually.

Live sheep exports remain an important component of the Australian sheepmeat industry. In 2008–09, Australia exported over 4 million sheep, principally to Middle Eastern countries such as Saudi Arabia, Kuwait, Bahrain, Oman and Jordan. This market is worth \$370 million and has increased by 81 per cent over the last 10 years.

### **2.2.3 Investment in research, development and extension**

The success of the Australian sheepmeat industry is largely a reflection of a coordinated approach to marketing, and research, development and extension (RD&E) facilitated by effective strategic plans. Since 1991, industry has collectively invested over \$895 million in on-farm RD&E. This investment is a mixture of levy funds from producers, matching Australian Government funds and contributions from RD&E providers such as departments of primary industries and CSIRO. This investment can be attributed to have returned \$1.7 billion to the industry representing an internal rate of return of 28 per cent or a cost–benefit ratio of 1:3.6.<sup>5</sup> These numbers show that effective and coordinated investment in RD&E in the Australian sheepmeat industry by industry and government agencies is likely to return significant benefits to the whole industry.

### **2.2.4 Industry opportunity**

In addition to the positive outlook for lamb market development and growth in demand, prime lamb and sheepmeat producers have significant opportunities to improve the productivity and profitability of their enterprises. The most current ‘Australian lamb’ Australian Bureau of Agricultural and Resource Economics (ABARE) report<sup>6</sup> reported a rate of return (excluding capital appreciation) of just 1.3 per cent for sheep producers producing prime lamb. However, although industry benchmarking databases support the position of modest returns to the average producer, the datasets also illustrate that significant variation exists.

For example, the Farm Monitor Project — South West Victoria reports a number of enterprise financial performance measures for prime lamb and wool enterprises. Table 2.1 on the following page, illustrates the large variation (over 100 per cent in several cases) in gross margin between average and ‘top 20 per cent’ producers.

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<sup>5</sup> CIE (Centre for International Economics) (2008). *An evaluation of lamb on-farm programs and an evaluation of domestic and US lamb marketing*, CIE, Canberra.

MLA (Meat & Livestock Australia) (2009). *Lamb survey results January 2009*, MLA, Canberra.

<sup>6</sup> ABARE (Australian Bureau of Agricultural and Resource Economics) (2009). *Australian lamb 09.1: financial performance of slaughter lamb producing farms, 2006–07 to 2008–09*, ABARE, Canberra.

Table 2.1 Key performance indicators of prime lamb and wool enterprises

	Average	Top 20%
<b>Prime lamb enterprises</b>		
Gross margin (\$/DSE)	\$13	\$21
Gross margin (\$/ha)	\$257	\$517
Gross margin (\$/ha/100 mm rainfall)	\$46	\$94
<b>Wool enterprises</b>		
Wool gross margin (\$/DSE)	\$14	\$21
Wool gross margin (\$/ha)	\$236	\$453
Wool gross margin (\$/ha/100 mm rainfall)	\$44	\$85

DSE = dry sheep equivalent; ha = hectare; mm = millimetre

Note: The top 20 per cent ranked according to gross margin per hectare per 100 mm rainfall.

Source: DPIV<sup>7</sup>

## 2.2.5 Industry challenges

The lamb industry competes with cropping, beef and wool production in the enterprise mix on many Australian farms. To increase the scale of the industry and meet growing demand for sheepmeat products, the returns from sheepmeat must be comparable or superior to cropping, beef and wool and opportunities for improved integration of enterprises must be capitalised upon in multi-enterprise businesses.

The heavy manual labour involved in sheep production is a disincentive for many and a significant deterrent to increasing sheep numbers in the enterprise. Reducing the labour requirements associated with lamb production will be an important factor in retaining producers in the sector in the future.

The community is placing increasing pressure on the sheep industry to apply the highest standards of animal welfare and reduce environmental impacts. Addressing both these issues will be a high priority for the industry and RD&E in the future.

<sup>7</sup> DPIV (Department of Primary Industries Victoria) (2008). *South West Farm Monitor Project, summary of results 2007/2008*, DPIV, Melbourne.



### **3 Industry research, development and extension investment priorities**

This section discusses the vision, industry and state agency priorities, and linkages to other agencies that are associated with the sheepmeat industry in Australia.

#### **3.1 Vision**

Following industry and government agency consultation, the following vision has been developed for the sheepmeat production RD&E strategy:

A profitable, competitive and sustainable sheepmeat production sector that meets or exceeds supply chain, consumer and community expectations.

#### **3.2 Identifying industry priorities**

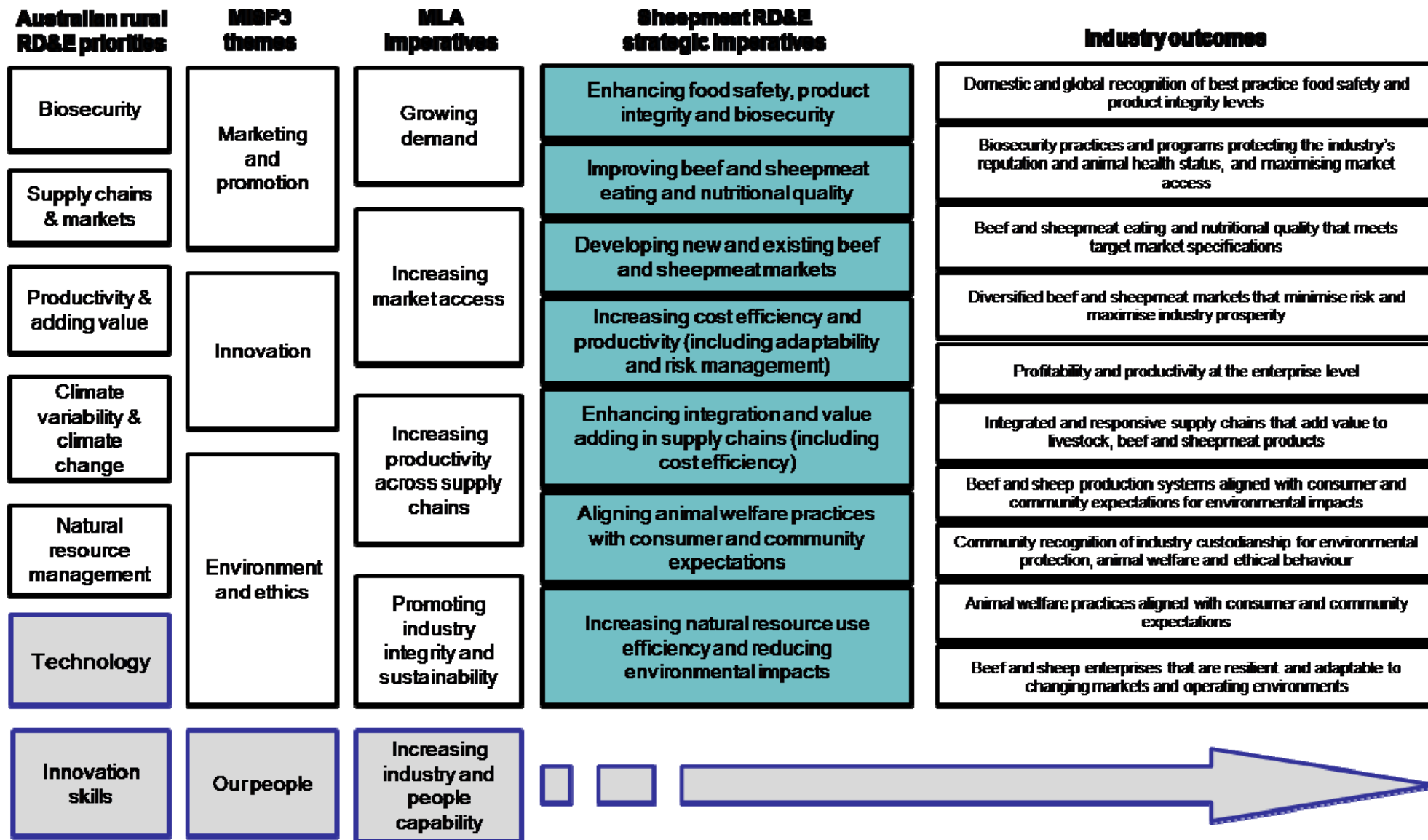
The development of an industry plan and the setting of investment priorities requires input from producers and processors, in consultation with RD&E organisations that have the capacity to execute the plan. With this as the focus, the Southern Australia Beef Research Council (SABRC; which will broaden its remit to include sheepmeat in 2010) and MLA ran three regional consultation forums at Tamworth, Adelaide and Bendigo during October–November 2008. These forums gathered information on industry priorities for future RD&E. The participants were a mixture of producers, state and territory farming group representatives, state and territory agencies, and MLA representatives.

A subsequent forum for meat processors, wholesalers and retailers was run by I&I NSW and MLA in April 2009 to enable those further along the supply chain to contribute to development of the plan.

These forums provided the RMCIC with information to develop seven strategic imperatives that form the basis for the Strategy:

1. Enhancing food safety, product integrity and biosecurity.
2. Increasing natural resource use efficiency and reducing environmental impacts.
3. Increasing cost efficiency and productivity (including adaptability and risk management).
4. Enhancing integration and value adding in supply chains (including cost efficiency).
5. Improving sheepmeat eating and nutritional quality.
6. Developing new and existing sheepmeat markets.
7. Aligning animal welfare practices with consumer and community expectations.

These seven strategic imperatives, on which the Strategy is based, and their relationship to the Meat Industry Strategic Plan (MISP) and Australian Government priorities is illustrated in Figure 3.1 on the following page.



MISP = Meat Industry Strategic Plan; MLA = Meat & Livestock Australia; RD&E = research, development and extension

Figure 3.1 National sheepmeat production research, development and extension strategic imperatives and their relationship to other national plans

### 3.3 State agency priorities

As part of the development of the RD&E strategies, the Primary Industries Standing Committee (PISC) Research and Development Subcommittee has requested that each agency identify whether their organisation will take a ‘major’, ‘support’ or ‘link’ role in sheepmeat production RD&E in the future.

The definitions of major, support and link for the purposes of the Strategy are:

- major — the agency will take a national lead role by providing significant RD&E effort
- support — the agency will undertake RD&E, but other agencies will provide the major effort
- link — the agency will undertake little or no RD&E: instead it will access information and resources from other agencies.

Table 3.1 indicates the priority that each state agency involved in development of the Strategy places on sheepmeat production RD&E. The states intending to take a major role in sheepmeat RD&E in the future (New South Wales and Victoria) also have the largest capability in terms of full-time equivalent (FTE) staff. Agencies indicating a support role also have significant capability currently allocated to the sheepmeat production sector.

Table 3.1 Sheepmeat production research, development and extension priority in state agencies<sup>a</sup>

State agency	Intended role in sheepmeat RD&E	FTE capacity in sheepmeat (2009)
Primary Industries Research South Australia	Support	21.7
Department of Food and Agriculture Western Australia	Support	30.5
Department of Primary Industries Victoria	Major	53.6
Tasmanian Institute of Agricultural Research	Link	4.9
Department of Employment, Economic Development and Innovation Queensland	Link	1.5
Industry & Investment New South Wales	Major	50.5
<b>Total</b>		<b>162.7</b>

FTE = full-time equivalent; RD&E = research, development and extension

<sup>a</sup> The total capacity in sheepmeat production RD&E across state agencies, CSIRO and the university sectors is 275.6 FTE (Section 4.1)

In developing this plan, each agency has also indicated the relative future priority (high, medium or low) that it places on each of the strategic imperatives within the Strategy.

In Table 3.2, the current FTE capacities for sheepmeat production RD&E within each state agency are compared with priorities for investment at the strategic imperative level.

**Table 3.2 Strategic imperatives mapped by agency priority and the current full-time equivalent staff capability (2009)**

Strategic imperatives	Agency FTE						Total
	PIRSA	DAFWA	DPIV	TIAR	DEEDI (Qld)	I&I NSW	
1. Enhancing food safety, product integrity and biosecurity	0.0	0.0	4.4	0.0	0.2	13.6	18.2
2. Increasing natural resource use efficiency and reducing environmental impacts	0.4	1.4	19.0	1.5	0.1	7.3	29.7
3. Increasing cost efficiency and productivity (including adaptability and risk management)	20.0	24.5	20.6	2.6	0.0	15.2	82.9
4. Enhancing integration and value adding in supply chains (including cost efficiency)	0.0	0.0	1.9	0.0	0.8	1.0	3.7
5. Improving sheepmeat eating and nutritional quality	1.1	3.3	2.1	0.0	0.1	3.1	9.7
6. Developing new and existing sheepmeat markets	0.0	0.0	1.2	0.0	0.1	0.4	1.7
7. Aligning animal welfare practices with consumer and community expectations	0.2	1.3	1.9	0.3	0.2	1.2	5.1
Other	0.0	0	2.5	0.6	0.0	8.7	11.8
<b>Total</b>	<b>21.7</b>	<b>30.5</b>	<b>53.6</b>	<b>4.9</b>	<b>1.5</b>	<b>50.5</b>	<b>162.7</b>

FTE = full-time equivalent; RD&E = research, development and extension

■ High priority ■ Medium priority ■ Low priority

Notes: The total capacity in sheepmeat production RD&E across state agencies, CSIRO and the university sectors is 275.6 FTE (Section 4.1)

'Other' means that the organisation has the FTE capacity that is engaged in work not covered or described by items 1-7

No shading indicates that the organisation has not placed any priority on that particular strategic imperative

Table 3.2 indicates that, currently, most capability in the state public sector agencies exists within strategic imperatives 2 and 3, which are associated with the efficient use of natural resources and productivity on-farm. This is not surprising, given the importance of sustainable use of resources and productivity in driving the performance of a land-based industry, and the role of government investment in on-farm RD&E and public good outcomes.

Historically, governments have not invested in RD&E further down the supply chain. The table indicates that these two strategic imperatives, and strategic imperative 1 (food safety, product integrity and biosecurity), are considered to be a high priority for the future by these agencies.

### 3.4 Linkage to other strategies

This strategy identifies all RD&E activity considered by industry to be a priority for the sheepmeat production sector. Many of the programs and deliverables that have been identified for consideration by the RMCIC require investment activities that are the same as or have some relevance to other sectoral and cross-sectoral plans, such as beef, wool, animal welfare and climate change.

The Strategy has been developed to provide a complete picture of the requirements of the pre farm-gate sector. Many of the priorities and programs will be implemented as part of cross-sector and cross-industry investments. These linkages will reduce duplication and increase the efficiency of investment in the future.

Care should be taken not to ‘double count’ capacity and investment intentions between sectoral and cross-sectoral plans.

The cross-sectoral strategies will summarise what is happening across all industry sectors relevant to that topic, identify gaps in investment and ensure collaboration across sectors, where it is appropriate.

#### Southern Australia Beef Research Council – an expanded role

The Southern Australia Beef Research Council (SABRC) is a key industry–agency forum with the responsibility of determining and advising on strategic requirements for RD&E activities in the beef industry in southern Australia. SABRC acts as the central consultative council comprising all major southern beef RD&E agencies and educational institutions (departments of primary industries, CSIRO, Cooperative Research Centres and universities) and producer representatives from applicable states and territories.

In 2010, following formal support from the sheepmeat industry’s peak industry council, SCA, SABRC’s agency and producer representation will be broadened to provide (under a different name) combined representative coverage for Australia’s southern beef and national sheepmeat industries. Accordingly, SABRC, in its expanded role, will contribute to overseeing and implementing the processes and policies developed by RMCIC in relation to collaboration, program coordination and monitoring and evaluation for implementation of this Strategy.

In addition, SABRC will have formal linkages to other sheep industry organisations, including SCA, and state and territory farm organisations, and provide information and advice to support RD&E policy development by these prescribed bodies. Oversight of the activities of levy-funded service companies, including MLA’s involvement in delivering the objectives of Meat Industry Strategic Plan, is the express responsibility of peak industry councils (including SCA). As such, SCA has the overarching authority over MLA’s strategic direction within the Strategy.



## 4 Capability, infrastructure and intellectual property

This section presents current sheepmeat industry capability, infrastructure and intellectual property available to the Strategy.

### 4.1 Capability

In the preparation of the Strategy, significant effort has been allocated to collecting data that describe the current status of human capacity, infrastructure and sheep research flocks across the broad spectrum of organisations contributing to the national RD&E effort.

Detailed summaries on an organisational basis are provided in Appendix A for full-time equivalent (FTE) capacity in relation to the Australian Standard Research Classification, employment classifications, strategic imperatives and age classification. A snapshot of the national data is provided in figures 4.1–4.3. This information will be used by each RMCIC member organisation to inform their decisions about research capability and its application to investment priorities at the strategic imperative and program levels.

These data represent a new opportunity to integrate reallocation and succession planning activities where appropriate. RD&E resourcing will be an ongoing area of RMCIC consideration under the Strategy, with the aim of increasing efficiency of resource use and ensuring that skills that are scarce are applied to the highest priority RD&E activities. In particular, the RMCIC will use this dataset in 2010 to consider the effect of short-term and project-based funding on the future supply and development of important research and technical skills. This information will have an influence on actions taken.

The current snapshot of capability prepared for the Strategy indicates that a total of 276 FTEs were engaged in sheepmeat production RD&E across the government agencies, CSIRO and universities in 2009. Figure 4.1 on the following page, indicates that the bulk of this capacity was in the field of animal production, with other substantial capacity existing in the fields of veterinary science, extension (other), and crop and pasture science. Within the organisations, there is substantial capacity within other scientific disciplines (eg soil and water, biometrics, economics and business) that is not currently allocated directly to sheepmeat production RD&E, but could be called upon to address specific issues as required. This capacity is not recorded here.

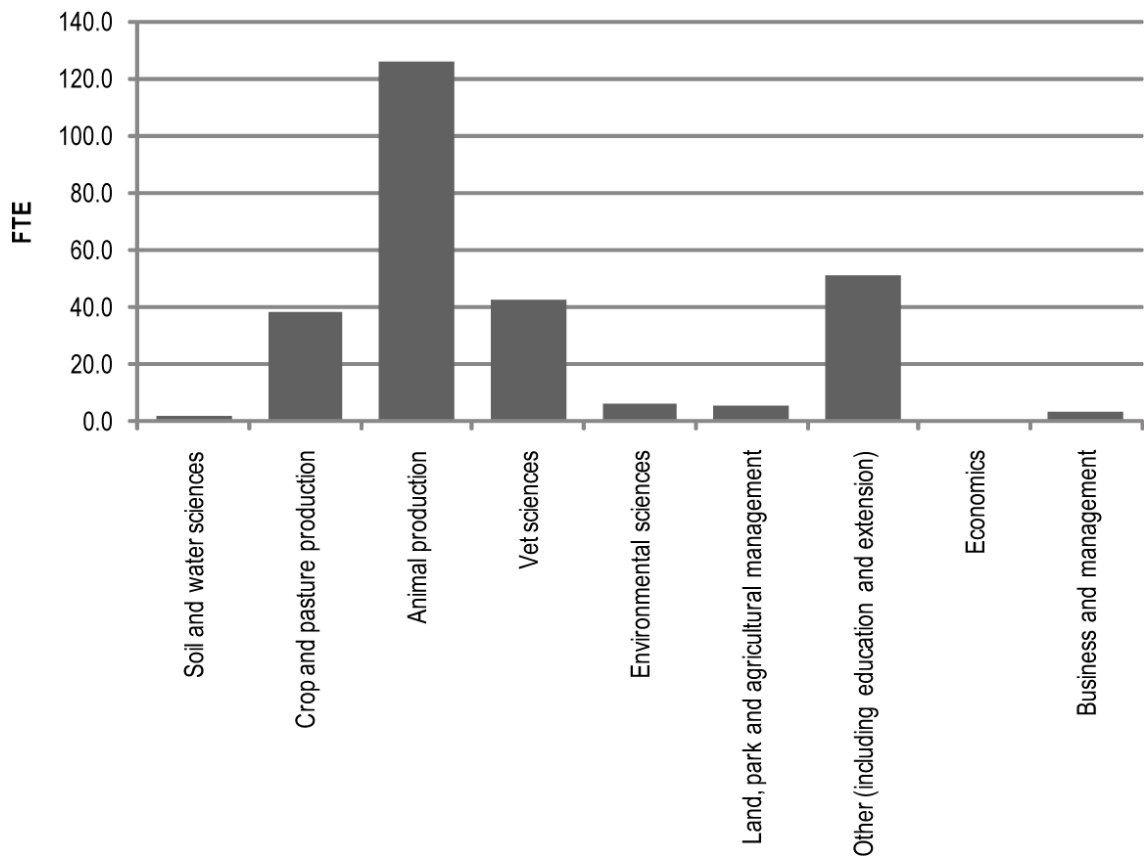


Figure 4.1 Full-time equivalent (FTE) staff in sheepmeat production research, development and extension by Australian Standard Research Classification series (2009)

Figure 4.2 provides a snapshot of capability defined by employment classification. Across all research provider agencies, there are approximately 104 FTEs classified as research staff, 68 in technical roles and 48 classified as working in extension. When a 2.5 multiplier is applied to base salaries to account for internal organisational costs<sup>8</sup>, the total investment in human capability is valued at \$48.5 million per year.

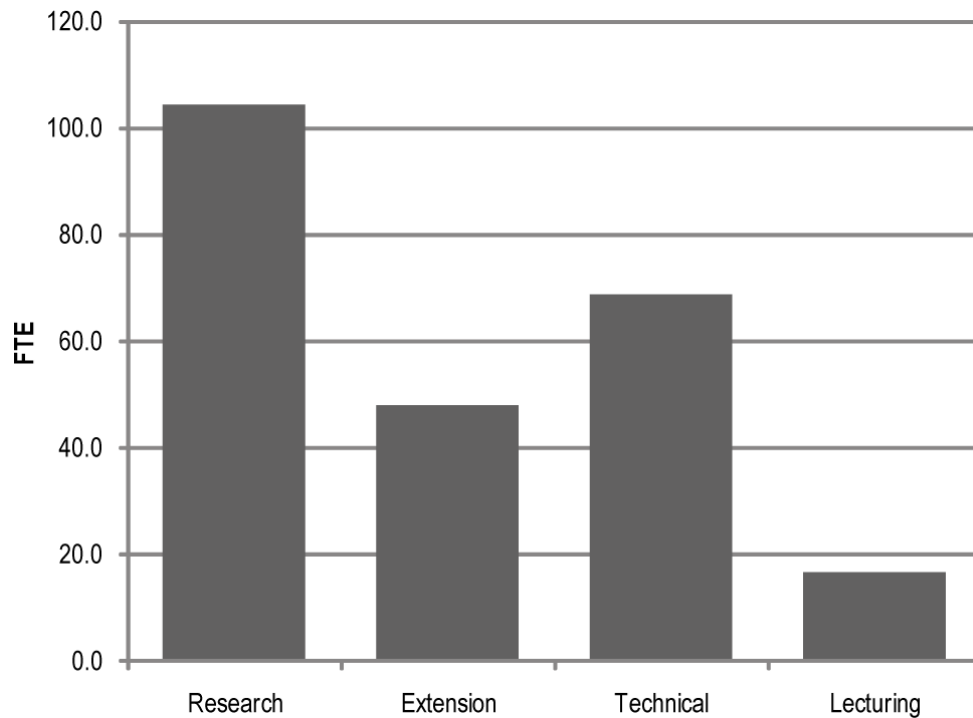


Figure 4.2 Full-time equivalent (FTE) staff in sheepmeat production research, development and extension by employment classification (2009)

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<sup>8</sup> McCausland I (2006). *Report on MLA–DPI audit relating to livestock production research, development and extension*. Meat & Livestock Australia Ltd, Canberra.

Figure 4.3 shows the heavy focus on productivity and cost-efficiency RD&E for the sheepmeat production sector — 139 FTEs have been allocated to strategic imperative 3 (increasing cost efficiency and productivity). This is not surprising, given the focus that industry and government has had on profitability and productivity in the past.

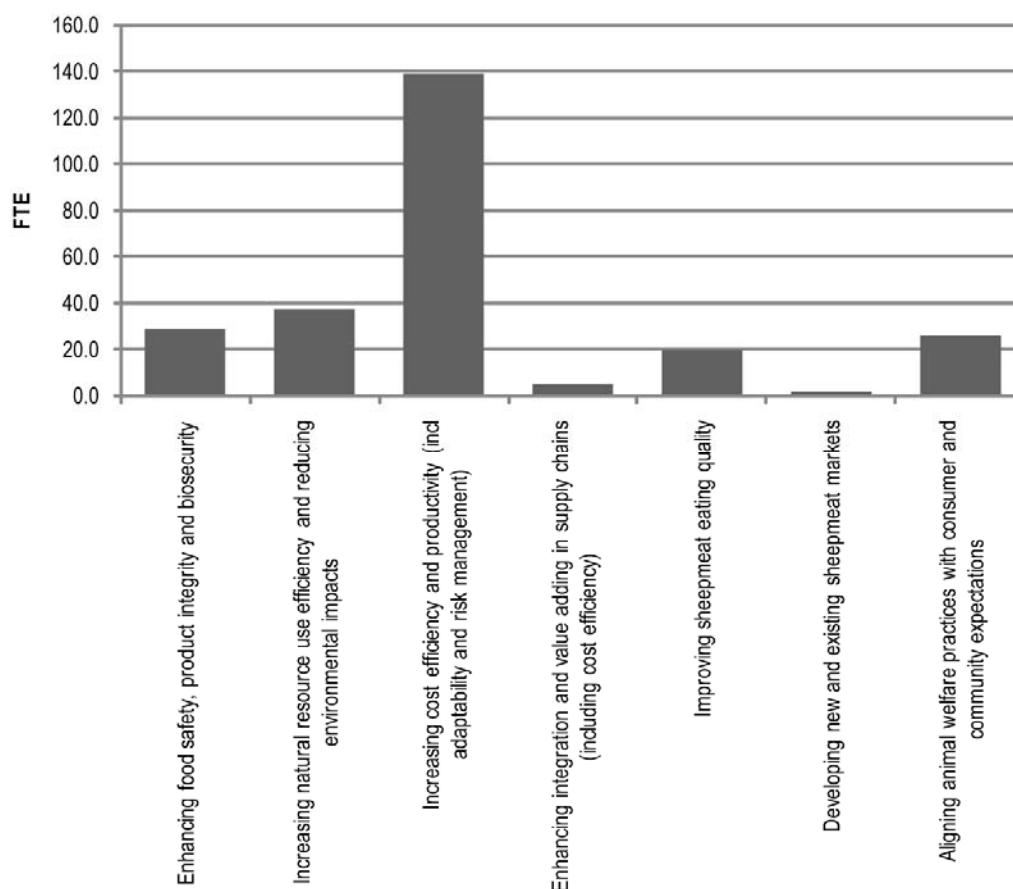


Figure 4.3 Full-time equivalent (FTE) staff in sheepmeat production research, development and extension by strategic imperative (2009)

The prioritisation of strategic imperatives and programs for future investment is underway within the RMCIC. Once this prioritisation is finalised, the RMCIC will consider emerging gaps in capability and how capability might be moved into new investment areas through training, succession planning and interagency agreements. This process could include actions to address problems identified relating to researchers supported by short-term or project-based funding.

In 2009, there were at least 125 postgraduate students studying topics relevant to the livestock industries (sheepmeat, beef, wool and dairy) and approximately 950 students due to graduate from tertiary courses that were relevant to the rural sector (Appendix B).

## 4.2 Infrastructure and intellectual property

Across the organisations contributing data to the Strategy, there are 44 research stations located in agri-ecological zones suitable for sheep production. In total, 32 sheep research flocks are located across these research stations (Appendix C). Section 5.4 describes the process that will be applied by the RMCIC to prioritise this infrastructure for retention and future investment.

## 4.2.1 Livestock and pasture resources and databases

Databases and sample collections have been created over many years of research across Australia. These are an essential research tool. Often, historical data can be re-analysed to answer current questions and address emerging issues that were not a priority in the original projects. These data can also provide important information for use in the design and implementation of new RD&E.

The member organisations of RMCIC own many databases and generally seek to ensure that data and intellectual property are available for future public good. Thus, the databases have been available for research and development, with access to data and outcomes licensed through appropriate contracts. It is likely that the future development of RD&E programs will require access to historical datasets and intellectual property — this should be a formal consideration of program development and implementation.

Government agencies have previously transferred relevant genetic and phenotypic resources from completed programs to new programs. For example, ewes were transferred from the Falkiner Memorial Field Station genomics project (funded by MLA and Australian Wool Innovation) to four government agencies for inclusion in the Sheep CRC ‘Information Nucleus Flocks’. This transfer enabled the continual recording of difficult and expensive-to-measure traits, and provided effective links between the projects to build on genetic and genomic outcomes for the sheep production sector.

Maintenance and security of historical databases is an issue, particularly if computer software and hardware is changed or updated, or key staff retire or change roles. The development of centralised databases with common structures within each organisation is recommended. This will provide easier access to data resources in the future. Financial support may be required to ensure the development of appropriately maintained databases. For example, the Falkiner Memorial Field Station database has been transferred to Sheep Genetics and the Sheep CRC to enable the linking and management of all three datasets.

In 2003, an audit of sheep databases and animal resources was conducted by the Sheep CRC 1. After seven years, an updated audit is recommended for the sheep industry.

Significant sheep databases include:

- Sheep CRC — the Sheep CRC 1 audit of Australian resource flocks and databases (managed or owned by various organisations) provides information for each flock, including data recorded and tissue samples in storage or available
- Information Nucleus Flock database
- SheepGenomics database
- Sheep Genetics database.

Livestock resources include the Information Nucleus Flock, which is an Australia-wide flock located at eight sites and managed by the Sheep CRC.

Existing databases for sheep are being shared through the Sheep CRC. For example, the SheepGenomics flock has been distributed to various locations across Australia. These arrangements were facilitated and funded by the Sheep CRC. In the absence of a CRC or its equivalent, the future function of coordinating access and sharing of livestock resources and databases will be assumed by the RMCIC. The RMCIC will update the Sheep CRC 1 audit of sheep databases during 2010 to facilitate data sharing and collaboration between agencies involved in sheepmeat production RD&E.

## 4.2.2 Pastures and plant genetic resources

The current Australian network of plant genetic resources encompasses three pasture collections:

- Australian Trifolium Genetic Resource Centre (Western Australia)
- Australian Medicago Genetic Resource Centre (South Australia)
- Tropical Crops and Forages Genetic Resource Centre (Queensland).

Other pasture gene banks of value also exist within Australia:

- temperate forages (grass, legumes and herbs) (Tasmania)
- temperate forages (mostly grasses) (Victoria)
- collections of white clover (*Trifolium repens*) and trefoil (*Lotus* spp) (New South Wales and Victoria).

Industry and government are currently unable to sustain these pasture plant gene banks and databases. The collections are at risk and their maintenance requires the attention of government and industry. The Australian Government has an obligation to support conservation and international distribution of seed since its signing of the International Treaty on Plant Genetic Resources for Food and Agriculture in 2002. The future of these genetic resources and databases needs to be considered and included in the development of a cross-sectoral RD&E strategy for pastures when it is developed.

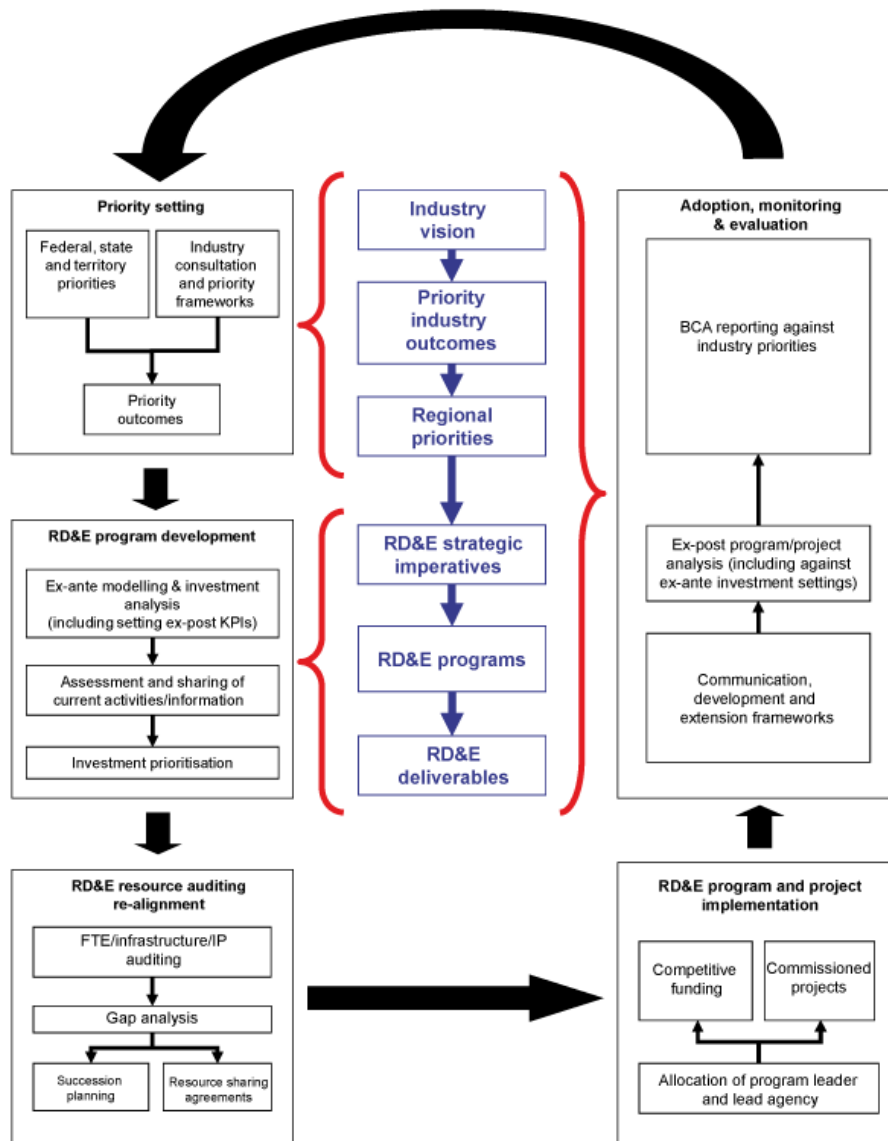
## 4.2.3 Other forms of intellectual property

The agencies contributing to sheepmeat production RD&E in Australia own other forms of intellectual property not listed above, possibly including: copyrights, patents and inventions, trademarks (including brands), industrial design rights, circuit layouts, trade secrets and confidential information, know-how, plant breeders and variety rights, and moral rights. Also relevant are: digital, broadcast and URL rights, indigenous intellectual property, and rights relating to the use of indigenous flora and fauna. Patents and confidential information in particular are owned individually, jointly and collectively by the agencies themselves, as well as the joint ventures they have been involved in (eg CRCs). In many cases, packages of intellectual property are licensed to private entities for the purpose of commercialisation, and those agreements are enforceable.

It is impractical to list and define all the packages of intellectual property that will be relevant and valuable for current and future sheepmeat production RD&E, or indeed the commercial arrangements that have been put in place for each. The PISC R&D Subcommittee will be discussing this broad issue for all of the sectoral and cross-sectoral RD&E plans in early 2010 to be consistent with the principle ‘...to freely share the knowledge generated through the primary industries National RD&E Framework, including minimising barriers to RD&E created by intellectual property protection’. The parties to the Strategy and the RMCIC will pay particular attention to any new knowledge or intellectual property generated by parties working under the new arrangements. The guiding intent in the first instance will be to improve the flow of information for the benefit of Australian industry and the community. A realistic initial goal is to increase the access of all parties to know-how and confidential information, while at the same time endeavouring not to compromise commercial opportunities or the moral rights of the discoverers.

## 5 New processes for collaborative investment

The collaboration by government agencies through the RMCIC is a significant change to the way that decisions about sheepmeat production RD&E investment have been made in the past. The following section provides details of the processes that will be implemented by the RMCIC to ensure effective collaboration and integration of investment activities in the future. Figure 5.1 is a diagrammatic representation of the implementation processes that will be managed by the RMCIC and described in sections 5.1–5.10.



BCA = Benefit Cost Analysis; FTE = full-time equivalent; IP = intellectual property; RD&E = research, development and extension

Figure 5.1 Red Meat Co-investment Committee processes for implementation of the sheepmeat production RD&E strategy

## 5.1 Evaluation and prioritising of investment

The industry consultation process detailed in Section 3.2 identified a range of priorities for sheepmeat production RD&E investment. These priorities have been organised into 34 prospective programs under the seven strategic imperatives described in Figure 3.1, and will be used by the RMCIC to plan future investment in RD&E for sheepmeat production.

The Modelling Working Group (MWG) has been established as a subcommittee of the RMCIC to undertake economic evaluation of programs and provide advice on priorities for investment based on likely economic, environmental and social benefits. Members of the MWG are drawn from the government agencies and the private sector and have economics and evaluation expertise.

The funds required to invest in all 34 programs, and the programs themselves, are beyond the capacity of the RMCIC agencies to address with new initiatives in the short term. However, it is likely that many of the deliverables requested by industry already receive RD&E investment to varying degrees. The RMCIC will collate all current RD&E into 'virtual programs' during 2010. This will improve information exchange, encourage collaboration and connect project outputs to higher order outcomes.

The MWG has developed a rapid evaluation technique to provide a first-pass evaluation of potential programs and identify the most important programs for detailed investment analysis. The results of the first-pass evaluation and detailed investment analysis, including cost-benefit ratios and net present values, will be reported to the RMCIC and will inform the ranking of programs for future investment. The RMCIC will also consider the need to take a portfolio approach to investment across the spectrum of 'blue sky' and incremental RD&E opportunities, and to consider the risk associated with the various project types.

The intended first-pass evaluation and investment analysis process is detailed in Appendix D.

## 5.2 National program coordination and development

The Strategy will be implemented through multi-agency RD&E processes and programs overseen by RMCIC, with agency and industry direction through SABRC in its expanded role, and SCA as the primary industry consultation processes.

Coordination of agency investment in programs (or subprograms if more appropriate) will occur through the process described here, subject to review after two years.

The priority ranking for initial national RD&E programs will be determined by the RMCIC from the programs derived from the industry consultation process. This ranking will be informed by the broad investment analysis process described in Section 5.1. Any new programs will be prioritised using the same process. Programs are not a funding mechanism; their purpose is to coordinate individual agency investments for better industry and agency outcomes.

Individual agencies will take on program leadership roles, based on:

- relevance of the topic to their state and agency investment priorities
- their existing human and infrastructure resource capacity relevant to the topic
- their ability to commit resources to the program over its likely duration.

Some of the coordinating roles may be taken on by MLA, and the organisation may also provide funding to support agencies to take leadership roles. Processes to encourage competition (Section 5.6) will be incorporated at the project level.

For areas of large investment (eg strategic imperative 3 ‘increasing cost efficiency and productivity’), there are likely to be multiple programs per imperative. In areas of smaller investment (eg strategic imperative 7 ‘aligning animal welfare practices with consumer and community expectations’), one program is likely.

Program management will entail three key functions:

- gather information on current RD&E investment and collate this activity into ‘virtual programs’ as per the program structure agreed by the RMCIC
- monitor the degree to which current activity meets the identified priorities in the Strategy and initiate new projects to fill gaps
- facilitate the implementation of new programs to address any industry priorities that are not currently addressed through existing investment.

An annual program development cycle will allow structured development of new programs as follows:

1. The RMCIC will meet in August each year to:
  - review progress in national programs, reported by each program’s lead agency
  - agree in principle on new (or significant changes to existing) priority programs or subprograms to commence in the following financial year, taking into account feedback on priorities from the SCA and SABRC; the Meat Industry and MLA Strategic Plans; other relevant strategies of the National Primary Industries RD&E Framework; priorities of the various state and territory governments; the Australian Government’s National Rural R&D Priorities; and research undertaken in existing projects to identify industry RD&E needs.
2. The agency proposing to develop and lead a new or changed program will present a detailed ‘value proposition’ to the RMCIC (based on analysis provided through the MWG) and nominate a program leader to develop program targets.
3. Lead agencies will work with contributing agencies to develop program targets and concepts, and identify resource needs. Lead agencies will also propose solutions to resource gaps and draft requirements for new interagency arrangements.
4. Each program concept will include a logical framework to describe the monitoring and evaluation mechanisms and systems (on a national, regional and local basis), the industry targets against which success will be measured and the key performance indicators that will be reported to RMCIC, industry and other stakeholder groups.
5. If the project teams have been decided collaboratively, the lead agency will be responsible for negotiating cash and in-kind contributions, as well as the work plan for each project. Where a preferred team has not been chosen (eg because the project requires development of new capability, new technologies or knowledge), then a competitive process will be used to select the most appropriate agency (see Section 5.6).

## 5.3 Mechanisms to monitor and address gaps in capability and infrastructure

Each August, RMCIC members will report and review recent and forecast changes in their human resource and infrastructure capability.

A simplified spreadsheet with automated analysis will be developed for updating the database, and a full audit will be conducted every three years to coincide with the planned external review requested by PIMC (Section 5.9).

Members will discuss options to address actual and forecast changes, and emerging requirements in capability and infrastructure on a national basis.

## 5.4 Prioritising infrastructure for future investment

Relevant infrastructure, sheep flocks and significant intellectual property available to the Strategy have been documented by the RMCIC (Section 4). Much of the infrastructure can be used for RD&E in other species (particularly other ruminant species) and for other commodities (to varying degrees), and this remains an important consideration in prioritising for retention.

The RMCIC will review the total list and agree on facilities, flocks and intellectual property critical for retention to support the Strategy, taking into account the following considerations:

- the needs of the priority RD&E programs identified via the MWG
- the recent history of use for RD&E for the relevant commodity.

Criteria that will be considered will include:

- for infrastructure
  - the extent to which it represents a significant and typical farming system in one of the priority agri-ecological zones and is not duplicated elsewhere
  - the extent to which it cannot be readily duplicated on commercial properties
  - where alternative infrastructure exists in other areas or other agencies, the condition and ‘state of the art’ nature of the infrastructure
  - the degree to which it is ‘multipurpose’ or ‘multicommodity’ and can be supported by a range of investors
  - the cost of maintaining it, and the priority and view of the current owner(s)
  - the extent to which revenues generated through its sale can be re-invested in alternative infrastructure to support the national RD&E strategy

for research flocks and intellectual property

- the extent to which the maintenance of the resource will build on existing data and result in cost savings by not repeating data collection in the future
- the relevance of the flock to current industry priorities for productivity and product attributes.

It is proposed that SABRC will review future regional requirements for infrastructure and make recommendations to industry and the RMCIC.

## 5.5 Succession planning

Succession planning is a process for identifying and developing internal personnel or recruiting new personnel with the potential to fill key or critical organisational positions. Succession planning ensures the availability of experienced and capable people who are prepared to assume these roles as they become available.

The Strategy aims to enhance RD&E capability through increased collaboration, specialisation and critical mass, as appropriate. Achieving these aims will depend on having continued access to experienced and capable research, extension, technical and lecturing expertise.

Although succession planning is an organisational responsibility, it will need to occur in the context of the National RD&E Framework. There will be a high cross-organisational and industry dependency on the continued supply of capability, and hence the need to consider succession planning as a key input into the design of the National RD&E Framework.

With the implementation of the National RD&E Framework and the formation of critical mass locations, there will be a reduction in the places from which to recruit capability in Australia. The capability audit provides for future resource planning on a national basis and the capacity to project career opportunities and encourage the retention of talented personnel.

Data supplied via RMCIC on capability by Australian Standard Research Classification and age classification provides some insight into future areas of focus for succession planning. Critical aspects of science discipline and industry leadership will need to be considered by RMCIC in the development of programs.

Although age is not a good indicator of the talent pool in any particular discipline series, it serves as some indication of the need and capacity for succession planning. Age data have been provided based on the groupings of younger than 40 years, 40–55 years and older than 55 years, and currently includes all staff classifications (research, technical, extension and lecturing). Further analysis will be undertaken for the next update of the Strategy. However, the personnel data available to the RMCIC suggest that:

- 44% (120 FTEs) of the capability mapped to sheepmeat is under the age of 40
- 14% (39 FTEs) is over 55 years of age.

Data provided on the number of postgraduates indicate that there are currently at least 125 students (84 related to animal production; 30 to vet sciences) that could potentially seek a career in sheepmeat and/or beef production RD&E. This suggests that there could be between 30 and 40 new postgraduate-trained scientists in the market each year. However, not all these will choose to be employed in the public research and university market sectors, and a proportion of international students will return to their home countries to work.

The universities that responded to the RMCIC's request for information reported that at least 948 undergraduate students were expected to graduate from rural-sector-related study in 2009 and this is predicted to rise to almost 1,350 students in 2013. Most of these undergraduate students are studying agriculture and rural sciences, animal sciences and vet sciences. There are significantly fewer studying environmental science, economics and agribusiness, and agricultural engineering (Appendix B), although more of these students may be studying at other universities.

From this initial analysis, it would seem a potential focus for succession planning would be in the areas of crop and pasture production, environmental science, and economics and management. However, the data reflect the capacity allocated specifically to sheepmeat production RD&E in 2009, and a review of other sectoral plans may reveal additional capacity in these disciplines that could potentially be allocated to sheepmeat RD&E if required. Development of the Strategy and its implementation through RMCIC using the processes described in Section 5 provide opportunities for an active program for developing skills and maintaining capacity within the sector. Issues for consideration include:

- scholarships for postgraduate study, in disciplines identified as lacking capacity, that are directly sponsored by employers and supported by vocational development activities
- secondment to allow for skills development and to address capacity issues in particular organisations
- the creation of 'virtual' teams to address specific high-priority issues for industry
- the creation of career pathways across the organisations contributing to sheepmeat (and related) RD&E
- opportunities for the development of leadership skills through the program leader roles that will emerge from this strategy
- development of leadership capability within industry organisations.

## **5.6 Maintaining the competitive funding element at the project level**

Competitive processes are a key feature of the Australian innovation system for several reasons. First, such processes give all eligible research providers (whether they have a history in production research or not) an equal opportunity to bid for research funds. This means that new ideas and novel approaches are considered periodically, in a system that might otherwise be closed. Second, competitive processes provide a degree of transparency to the process, demanding novelty, science quality, capacity, comparable costings from the research providers, and transparency of decision making and contestability on the part of the funding agency or its delegates.

The requirement for competitive funding is also essential for some research providers, especially the university sector. Funding that qualifies under the Australian Competitive Grants for Research (Category 1) contributes to the level of university research infrastructure block funding under the new Sustainable Research Excellence initiative. Funding success is also an important criterion of excellence in the new Excellence in Research for Australia Initiative.

Notwithstanding these benefits, competitive funding processes can be expensive, time consuming and suffer from the weaknesses common to all peer-review processes. An alternative, non-competitive model would be based on identifying the 'preferred' research teams (assessed against defined criteria) and commissioning them to undertake a research project. Commissioned research has constituted a growing proportion of the total red meat-sector funding over the last decade, and this is likely to increase due to the contraction in national research capability, the reduction in number of potential providers and the drive for increased cooperation between research providers.

Therefore, the most likely funding model under the Strategy will be a mix of both competitive and non-competitive funding elements. The process for commissioning a

preferred team to do research project work has been described in Section 5.2. The competitive process would require the program leader to publicise a call for expressions of interest from the research community to complete defined bodies of research work essential to enable an RD&E program to deliver the agreed deliverables to industry.

The selection criteria for successful project teams would need to be defined and a transparent process run by the program leader with reference to relevant external advice, such as peer review, and with the oversight of the RMCIC. In the long term, the incentive for research organisations to develop and maintain excellent and unique capability in a particular field would be the opportunity to become a preferred supplier of research in that field and for later funding rounds.

The other aspect of competition relates to demonstrated performance. Research groups that have been granted funding and that do not perform (either by not achieving milestones or not producing work of an appropriate quality) will risk losing preferred status. Other research groups will then be given the opportunity to compete for the research funds via the process defined above.

## **5.7 National communication, development and extension**

The effective development and extension of research outputs generated through the Strategy is imperative in ensuring that the value of these investments is realised by industry stakeholders. Such value, at an enterprise and whole-of-industry level, only arises from the timely and effective implementation of new technologies, knowledge and practices. The current time lag in adoption, fragmentation in extension delivery, and lack of industry skills and capacity to capitalise on the advantages of new knowledge and technology must be addressed. This will improve productivity and industry resilience to respond to the social, physical and financial effects of seasonal adversity, rising input costs, and variability in markets and climate.

A highly collaborative approach is required to ensure efficient and consistent extension processes and better harvesting of new RD&E ideas. This approach relies on integrated mechanisms for communication, development and extension (CD&E) of research outputs, in which all contributing agencies have a defined and integrated role in the funding, coordination, delivery and monitoring of related activities.

CD&E programs will coordinate regional development and local extension of the outputs from national research programs. These programs will:

- identify extension needs and align appropriate CD&E delivery methods in consultation with industry and extension agencies
- develop and promote quality controls and minimum delivery standards, based on accountable and consistent monitoring and evaluation of program outcomes
- broker delivery arrangements in each state through government agencies, Research and Development Corporations, and other organisations and individuals, including efforts to build private capability where appropriate.

The purpose of each CD&E program is to facilitate — at a local, regional and national level — long-term consistency, efficacy and efficiency in the conduct of sheepmeat development and extension. Each program will provide a consistent approach for all delivery agencies to interact with entities (including the private sector) who are not formally engaged with the Strategy. The objectives of this approach are to:

- ensure consistency and relevance in the key messages, information and tools extended to industry
- recognise and accommodate regional and local differences in RD&E needs and delivery capability
- enable standardised monitoring and evaluation of the impact of RD&E investments in industry
- improve the cost efficiency and long-term efficacy of extension resources
- foster timely and robust industry and agency engagement in the identification, prioritisation and evaluation of RD&E programs and investments.

CD&E programs will be positioned and directed (at a strategic level) under the existing industry–agency consultative forum provided by SABRC, which will assume a dual-species (beef–sheepmeat) role in the near future.

A regional network of consultative industry–agency committees is planned for implementation in southern Australia under SABRC and will underpin each CD&E program. This network will provide for the concurrent exchange of RD&E outputs and ideas of regional, sectoral and national relevance. It will also constitute a checking mechanism by which progress against the RD&E priorities and programs within the Strategy can be reported and evaluated. MLA, as a national industry services provider, will have a lead role in overseeing the coordination and strategic direction of each CD&E program, through SABRC.

## 5.8 Funding models and agreements

During the development of the National Dairy RD&E Strategy, the ‘Dairy Moving Forward’ Steering Committee identified six broad categories or types of investment models:

1. contract research and development
2. collaborative research and development (two-party project)
3. collaborative research and development (multi-party project or program)
4. unincorporated joint venture delivering programs
5. Cooperative Research Centres
6. incorporated joint ventures delivering programs.

Together, they represent a spectrum of models — from short-term contracts for specific outcomes using existing capability, to long-term multiparty joint ventures with management and ownership structures focused on solving underlying needs and often managing or building capability.

Although it was developed from a dairy-industry perspective, understanding this spectrum can inform discussion on which models, structures and combinations of these might be best suited to managing the changing needs of the Australian red meat industry with respect to RD&E and associated capability.

All of these models are valid and there are variations around each model. No model excludes the application of another and multiple models applied concurrently may be required in some situations. However, it will not be possible to achieve effective and efficient collaborative RD&E in the red meat industry without significant use of ‘the partnership models’ (ie models 2, 3 and 4), which would allow more complex issues to be addressed and would better build and maintain capability.

RMCIC has collected and collated information on the diversity of existing arrangements that exist between government agencies, CSIRO and universities. This information, together with an assessment of the strengths and weaknesses of alternative models, will be used by the RMCIC and its member organisations to determine the most appropriate forms of agreement for new collaborative RD&E programs.

## 5.9 Monitoring and evaluation

Each program investment plan will include a logical framework describing the monitoring and evaluation mechanisms and systems (on a national, regional and local basis), the industry targets against which success will be measured, and the key performance indicators that will be reported to RMCIC, SABRC, SCA and other stakeholder groups.

Program leaders will submit a brief report each year summarising relevant joint initiatives, highlights and progress against specific key performance indicators for consideration by RMCIC in August and review by SABRC at their next meetings. These reports, together with any significant changes in capacity and infrastructure, will be submitted to the Ministers at the final PIMC meeting each calendar year.

RMCIC members will actively participate in each external 3-year review as foreshadowed in the Statement of Intent. At these review points, the human capacity and infrastructure audit will be updated. Ex post (after the fact) analyses of return on investment will be undertaken by the MWG for each 3-year review.

## 5.10 Next steps

This document describes the processes that will be used by the RMCIC to implement a national strategy for sheepmeat production RD&E. In documenting the Strategy and its associated processes, the member organisations have identified the potential for increased resource use efficiency, succession planning and collaboration in the future.

This document represents a substantial step forward in implementing a new and increasingly collaborative approach for the sheepmeat production RD&E sector to deliver against identified, industry and government priorities. Future updates will expand the scope to include RD&E for the post-farm-gate and live-export sectors.

The Strategy and its implementation plan will evolve over time and PISC and PIMC will be updated on progress.

The work plan for the RMCIC beginning in 2010 includes:

- refining the programs and deliverables for the Strategy
- incorporating input and priorities from the broader sheepmeat supply chain (including live export, processing, wholesaling and retail)
- analysing current and modelling proposed program investments
- developing guidelines and templates for program management, and a position description for the program leader roles
- mapping current investment across the identified priorities and collating into 'virtual' programs
- drafting cooperating principles for the development of CD&E programs
- completing data collection and analysing capability and infrastructure
- simplifying data collection and analysing mechanisms for future use

- analysing the employment basis for current capability (permanent versus temporary industry funding)
- collecting regional estimates of private-sector capability
- mapping current capability against imperatives and programs
- prioritising infrastructure against imperatives and programs
- updating the audit of sheep production RD&E databases.

# Appendix A Sheepmeat production research, development and extension capacity

Table A.1 Sheepmeat production research, development and extension capacity (full-time equivalent) — categorised by Australian Standard Research Classification and age (2009)

ASRC		300100	300200	300400	300500	300800	300900	309900	340200	350200	Total
Organisation	Age <sup>a</sup>	Soil and water sciences	Crop and pasture production	Animal production	Vet sciences	Environmental sciences	Land, park and agricultural management	Other (including education and extension)	Economics	Business and management	
DEEDI (Qld)	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.3	0.2	0.0	0.0	1.0	0.0	0.0	1.5
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I&I NSW	1	0.0	1.2	8.9	0.6	0.0	0.1	6.0	0.1	0.0	16.9
	2	0.0	2.7	12.6	0.0	0.0	0.7	8.1	0.5	0.0	24.6
	3	0.0	1.9	3.2	0.1	0.0	0.1	3.7	0.0	0.0	9.0
DPIV	1	0.8	2.0	9.1	0.5	1.9	0.0	9.1	0.0	0.0	23.4
	2	0.2	9.1	8.0	0.2	3.5	0.0	4.8	0.0	0.0	25.8
	3	0.3	0.8	1.0	0.0	0.2	0.0	2.1	0.0	0.0	4.4
PIRSA	1	0.0	2.6	3.3	0.6	0.0	0.4	1.0	0.0	0.0	7.9
	2	0.0	7.0	0.8	0.6	0.1	0.0	1.0	0.0	0.0	9.5
	3	0.0	0.4	2.6	0.3	0.0	0.0	1.0	0.0	0.0	4.3
DAFWA	1	0.0	2.0	2.9	0.3	0.2	0.3	3.5	0.0	0.7	9.9
	2	0.0	4.1	5.1	0.0	0.2	0.0	3.5	0.0	1.7	14.6
	3	0.0	0.7	1.8	1.0	0.2	0.0	1.4	0.0	0.9	6.0
NTDR	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TIAR	1	0.0	0.9	0.9	0.0	0.0	0.4	0.2	0.0	0.0	2.4
	2	0.0	0.7	0.0	0.0	0.0	0.2	0.8	0.0	0.0	1.6
	3	0.0	0.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.9
CSIRO	1	0.0	0.0	10.4	8.5	0.0	0.1	0.0	0.0	0.0	18.9
	2	0.0	0.0	8.3	3.7	0.0	1.2	0.0	0.0	0.0	13.1
	3	0.0	0.0	2.6	0.3	0.0	0.7	0.0	0.0	0.0	3.5
UNE	1	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
	2	0.0	0.0	2.1	0.5	0.0	0.0	0.0	0.0	0.0	2.6
	3	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1
University of Melbourne	1	0.0	0.0	2.2	7.2	0.0	0.0	0.7	0.0	0.0	10.2
	2	0.1	0.3	1.1	0.8	0.0	0.1	1.8	0.0	0.0	4.2
	3	0.0	0.0	0.3	0.3	0.0	0.0	0.2	0.0	0.0	0.8
University of Adelaide	1	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	2.6
	2	0.2	0.1	0.5	0.2	0.0	0.0	0.0	0.0	0.0	1.0
	3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Murdoch University	1	0.0	0.0	5.7	1.1	0.0	0.0	0.0	0.0	0.0	6.8
	2	0.0	0.4	4.7	1.2	0.0	1.4	0.0	0.0	0.0	7.6
	3	0.0	0.0	1.7	1.8	0.0	0.0	1.0	0.0	0.4	4.9
USQ	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Griffith University	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UQ	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LaTrobe University	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
	3	0.1	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.8
University of Sydney	1	0.0	0.2	0.7	8.0	0.0	0.0	0.0	0.0	0.0	8.9
	2	0.0	0.0	0.5	1.6	0.0	0.0	0.0	0.0	0.0	2.1
	3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
CSU (vet)	1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2
	2	0.0	0.0	3.2	1.2	0.0	0.0	0.0	0.0	0.0	4.4
	3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
UWA	1	0.0	0.0	8.2	0.0	0.0	0.0	0.0	0.0	0.0	8.2
	2	0.0	0.0	2.3	0.8	0.3	0.0	0.0	0.0	0.0	3.4
	3	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	2.3
JCU	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.5	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.7
	3	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.4
<b>Total</b>		<b>1.8</b>	<b>38.3</b>	<b>125.7</b>	<b>42.5</b>	<b>6.6</b>	<b>5.5</b>	<b>50.9</b>	<b>0.6</b>	<b>3.7</b>	<b>275.6</b>

ASRC = Australian Standard Research Classification; vet = veterinary science

a Age brackets are 1 = ≤40 years old; 2 = 40–55 years old; 3 = ≥55 years old

Note: Data from UWS, CSU (agriculture) not provided

**Table A.2 Sheepmeat production research, development and extension capacity (full-time equivalent) – categorised by employment classification and value of salaries (2009)**

Organisation	Research	Extension	Technical	Lecturing	Postgraduate students	Total	Salaries <sup>a</sup> (\$ million)	Salaries <sup>b</sup> (\$ million)
DEEDI (Qld)	0.2	1.0	0.3	0.0	0.0	1.5	0.133	0.260
I&I NSW	16.7	15.0	19.0	0.0	0.0	50.7	4.889	9.401
DPIV	28.0	16.0	9.8	0.0	0.0	53.8	4.773	9.179
PIRSA	11.5	3.1	6.1	0.0	0.0	20.7	2.013	3.870
DAFWA	13.0	10.0	7.1	0.0	0.0	30.1	2.824	5.432
NTDR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TIAR	2.1	1.0	0.5	0.1	0.4	4.1	0.449	0.865
CSIRO	10.9	0.0	16.3	0.0	8.3	35.5	3.201	6.150
UNE	1.8	1.0	0.0	1.4	2.2	6.4	1.166	2.244
University of Melbourne	7.2	0.7	0.3	2.1	4.2	14.5	1.302	2.506
Murdoch University	6.2	0.2	3.5	4.2	4.7	18.7	2.181	4.194
University of Adelaide	–	–	–	–	–	–	0.198	0.381
USQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Griffith University	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSU (vet)	0.0	0.0	1.1	3.3	0.3	4.7	–	–
La Trobe University	0.5	0.0	0.0	0.5	0.0	1.0	0.139	0.268
University of Sydney	3.8	0.0	3.6	0.3	3.5	11.1	0.799	1.539
UWA	1.8	0.0	1.0	4.1	7.0	13.9	0.995	1.915
JCU	0.5	0.0	0.0	0.6	0.0	1.1	0.128	0.247
<b>Total</b>	<b>104.1</b>	<b>48.0</b>	<b>68.5</b>	<b>16.6</b>	<b>30.6</b>	<b>267.8</b>	<b>25.2</b>	<b>48.5</b>

– = missing data; vet = veterinary science

a including 30% oncost

b including a 2.5 multiplier

Note: Data from UWS and CSU (agriculture) not provided

**Table A.3 Sheepmeat production research, development and extension capacity (full-time equivalent) — categorised by strategic imperatives (2009)**

Organisation	Enhancing food safety, product integrity and biosecurity	Increasing natural resource use efficiency and reducing environmental impacts	Increasing cost efficiency and productivity <sup>a</sup>	Enhancing integration and value adding in supply chains <sup>b</sup>	Improving sheepmeat eating quality	Developing new and existing sheepmeat markets	Aligning animal welfare practices with consumer and community expectations	Other	Total
DEEDI (Qld)	0.2	0.1	0.0	0.8	0.1	0.1	0.2	0.0	1.5
I&I NSW	13.6	7.3	15.2	1.0	3.1	0.4	1.2	8.7	50.5
DPIV	4.4	19	20.6	1.9	2.1	1.2	1.9	2.5	53.6
PIRSA	0.0	0.4	20.0	0.0	1.1	0.0	0.2	0.0	21.7
DAFWA	0.0	1.4	24.5	0.0	3.3	0.0	1.3	0.0	30.5
NTDR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TIAR	0.0	1.5	2.6	0.0	0.0	0.0	0.3	0.6	4.9
CSIRO	0.0	3.4	15.5	0.3	4.0	0.0	12.2	0.0	35.4
UNE	0.0	0.0	5.0	0.0	1.0	0.0	0.5	1.2	7.7
University of Melbourne	5.6	0.5	6.2	0.0	0.1	0.0	1.8	0.9	15.1
Murdoch University	3.9	0.0	8.6	0.5	4.5	0.2	1.2	0.2	19.2
University of Adelaide	-	-	-	-	-	-	-	3.6	3.6
USQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Griffith University	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSU (vet)	0.3	0.5	3.8	0.0	0.0	0.0	0.0	0.1	4.7
La Trobe University	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.2	1.0
University of Sydney	0.1	0.2	9.4	0.0	0.5	0.0	0.7	.3	11.2
UWA	0.0	2.6	6.3	0.1	0.0	0.0	4.1	0.8	13.9
JCU	0.2	0.0	0.7	0.0	0.0	0.0	0.0	0.2	1.1
<b>Total</b>	<b>28.3</b>	<b>36.9</b>	<b>139.1</b>	<b>4.6</b>	<b>19.8</b>	<b>1.9</b>	<b>25.7</b>	<b>19.3</b>	<b>275.6</b>

- = missing data

a including adaptability and risk management

b including cost efficiency

Note: Data from UWS and CSU (agriculture) not provided



## Appendix B Postgraduate and undergraduate students

Table B.1 Postgraduate students by Australian Standard Research Classification<sup>a</sup> (2009)

ASRC	300100	300200	300400	300500	300800	300900	309900	340200	350200	
Organisation	Soil and water sciences	Crop and pasture production	Animal production <sup>b</sup>	Vet sciences	Environmental sciences	Land, park and agricultural management	Other (including education and extension)	Economics	Business and management <sup>c</sup>	Total
UWA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Murdoch University	0.0	0.0	4.0	0.0	0.0	1.0	0.0	0.0	0.0	5.0
University of Adelaide	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
University of Melbourne	0.0	0.0	4.0	14.0	0.0	0.0	0.0	0.0	0.0	18.0
La Trobe University	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSU (vet only)	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5
University of Sydney	0.0	1.5	7.5	5.0	0.0	0.0	0.0	0.0	0.0	14.0
UNE	1.0	3.0	13.0	2.0	0.0	0.0	0.0	0.0	0.0	19.0
UQ	0.0	3.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
USQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSIRO	0.0	0.0	18.0	8.0	0.0	0.0	0.0	0.0	0.0	26.0
UTAS	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2.0
UWA	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
JCU	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
UWS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
<b>Total</b>	<b>1.0</b>	<b>8.5</b>	<b>84.5</b>	<b>29.5</b>	<b>0.0</b>	<b>2.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>125.5</b>

ASRC = Australian Standard Research Classification

a includes all livestock (beef, sheep, wool and dairy)

b 1 student at University of Adelaide reported by Sheep CRC; 8 students at University of Adelaide reported by Beef CRC; 3 students at UQ reported by Beef CRC; 4 students at University of Melbourne reported by Beef CRC

c 1 student at UWS reported by Beef CRC

Notes: Charles Sturt University (agriculture) not provided



Table B.2 Undergraduate students in the rural sector (2009)

		Numbers estimated to graduate by year				
		2009	2010	2011	2012	2013
<b><i>Agricultural science/rural science</i></b>						
<b>Institution</b>	<b>Degree</b>					
UQ	Agricultural Science	7	8	8	12	14
	Applied Science (Plant Studies)	5	5	5	8	10
	Applied Science (Food Science and Nutrition)	20	20	20	20	20
	Applied Science (Plants)	3	5	5	8	10
University of Melbourne	Agriculture/Agricultural Science +/- Management	100	70	70	65	85
University of Sydney	Agricultural Science	18	27	20	17	16
UTAS	Agricultural Science	8	12	12	12	12
	Applied Science (Agriculture)	8	8	8	8	8
University of Adelaide	Agricultural Science	40	40	40	40	40
UNE	Rural Science	10	15	20	20	20
	Agricultural Science	25	25	20	20	20
UWA	Science (Agriculture)	20	15	15	15	15
<b>Subtotal</b>		<b>264</b>	<b>250</b>	<b>243</b>	<b>245</b>	<b>270</b>
<b><i>Animal science</i></b>						
<b>Institution</b>	<b>Degree</b>					
UQ	Applied Science (Animal Production)	6	10	12	15	18
	Applied Science (Animal Welfare/Inspection)	7	10	10	12	15
	Applied Science (Production Animal Science)	15	15	17	22	25
University of Sydney	Animal & Vet Bioscience (Production)	27	25	40	46	53
	Animal & Vet Bioscience (Genetics)	12	11	18	20	22
Murdoch University	Animal Science	3	7	10	12	12
University of Adelaide	Animal Science	50	50	50	50	50
CSU	Animal Science	40	50	55	60	65
UNE	Livestock Science	10	10	10	10	10
UWA	Animal Science	15	20	20	20	20
<b>Subtotal</b>		<b>185</b>	<b>208</b>	<b>242</b>	<b>267</b>	<b>290</b>
<b><i>Veterinary science</i></b>						
<b>Institution</b>	<b>Degree</b>					
University of Sydney	Veterinary Science	102	120	115	125	110
University of Melbourne	Veterinary Science	108	110	110	110	110
Murdoch University	Veterinary Medicine and Surgery (beef and sheep)	10	10	10	10	10
UQ	Veterinary Science	109	120	100	130	120
CSU	Veterinary Science		30	52	60	60
University of Adelaide	Preveterinary Science		50	50	50	60
	Veterinary Science					50
JCU	Veterinary Science	40	60	60	60	60
<b>Subtotal</b>		<b>369</b>	<b>500</b>	<b>497</b>	<b>545</b>	<b>580</b>

		Numbers estimated to graduate by year				
		2009	2010	2011	2012	2013
<b><i>Environmental science</i></b>						
<b>Institution</b>	<b>Degree</b>					
University of Sydney	Land and Water Science	1	2	2	3	0
	Environmental Systems	0	0	0	0	30
Murdoch University	Environmental Science	35	35	35	35	35
UWA	Natural Resource Management	20	20	20	20	20
	Climate Studies			10	10	10
<b>Subtotal</b>		<b>56</b>	<b>57</b>	<b>67</b>	<b>68</b>	<b>95</b>
<b><i>Economics/agribusiness</i></b>						
<b>Institution</b>	<b>Degree</b>					
UQ	Agribusiness	18	18	27	27	30
University of Sydney	Agricultural Economics	26	35	45	40	35
	Resource Economics	15	20	10	15	17
UNE	Agriculture/Agribusiness			10	15	20
UWA	Commerce/Agriculture	10	10	10	10	10
<b>Subtotal</b>		<b>69</b>	<b>83</b>	<b>102</b>	<b>107</b>	<b>112</b>
<b><i>Agricultural engineering</i></b>						
<b>Institution</b>	<b>Degree</b>					
USQ	Agricultural Engineering	5	6	8	10	10
<b>Subtotal</b>		<b>5</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>10</b>
<b>Total</b>		<b>948</b>	<b>1104</b>	<b>1159</b>	<b>1242</b>	<b>1357</b>

Note: Numbers for La Trobe University, CSU (agriculture) and UWS not provided

## Appendix C Consolidated infrastructure and research flock data

Table C.1 Number of research stations in Australia according to agri-ecological zone and farming system (2009)

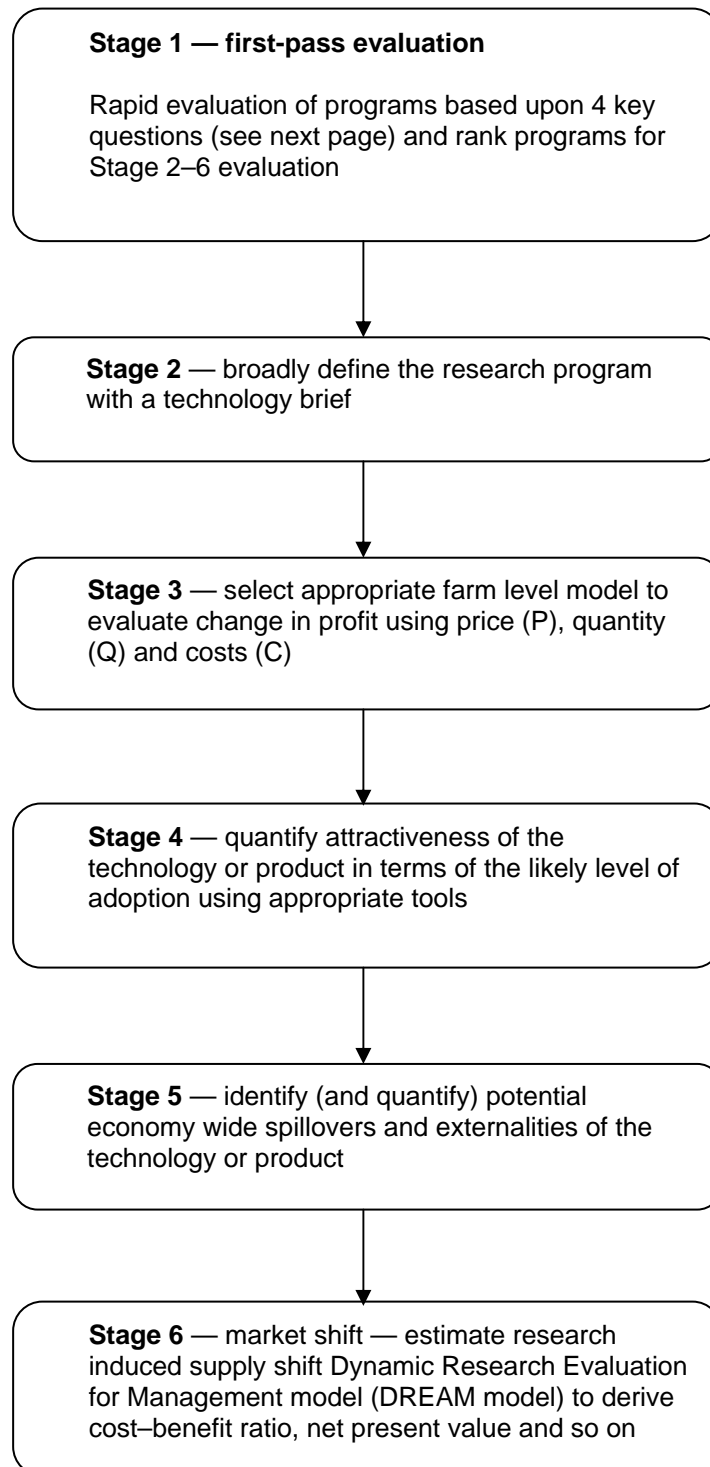
State	Agri-ecological zone					Farming system		
	Mediterranean	Mild/warm temperate	Cold/cool temperate	Tropical/subtropical	Low rainfall/rangeland	Mixed farming	Intensive grazing	Extensive grazing
New South Wales	10	8	3	4	2	9	6	12
Victoria	2	4	2	0	0	2	4	0
Tasmania	0	0	1	0	0	1	0	0
South Australia	3	0	1	0	0	4	0	0
Western Australia	6	0	0	0	0	4	1	0
Northern Territory	0	0	0	5	1	3	0	3
Queensland	0	0	0	10	2	2	2	7
<b>Total</b>	<b>21</b>	<b>12</b>	<b>7</b>	<b>19</b>	<b>5</b>	<b>25</b>	<b>13</b>	<b>22</b>

Table C.2 Number of research flocks in Australia (2009)

State	Merino	Meat breeds	Mixed	Head (no.)
New South Wales	3	0	6	20,000
Victoria	5	0	5	13,730
Tasmania	0	0	0	0
South Australia	6	0	1	6,200
Western Australia	5	0	1	24,900
Northern Territory	0	0	0	0
Queensland	0	0	0	0
<b>Total</b>	<b>19</b>	<b>0</b>	<b>13</b>	<b>64,830</b>



## Appendix D First-pass evaluation and investment analysis process



## First-pass evaluation questions<sup>9</sup>

1. What is the total farm-gate gross value of production (\$) of the industry or industry segment(s) for which the research and development is applicable?
2. How big are the likely enterprise profitability changes following successful implementation of the research and development?
3. What is the probability of success in the required research?
4. What is the maximum rate of adoption by producers within the industry/industry segment impacted by the research (refer to question 1)

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<sup>9</sup> Alston JM, Norton GW, Pardey PG (1995). *Science under scarcity*, Cornell University Press, Ithaca, NY.