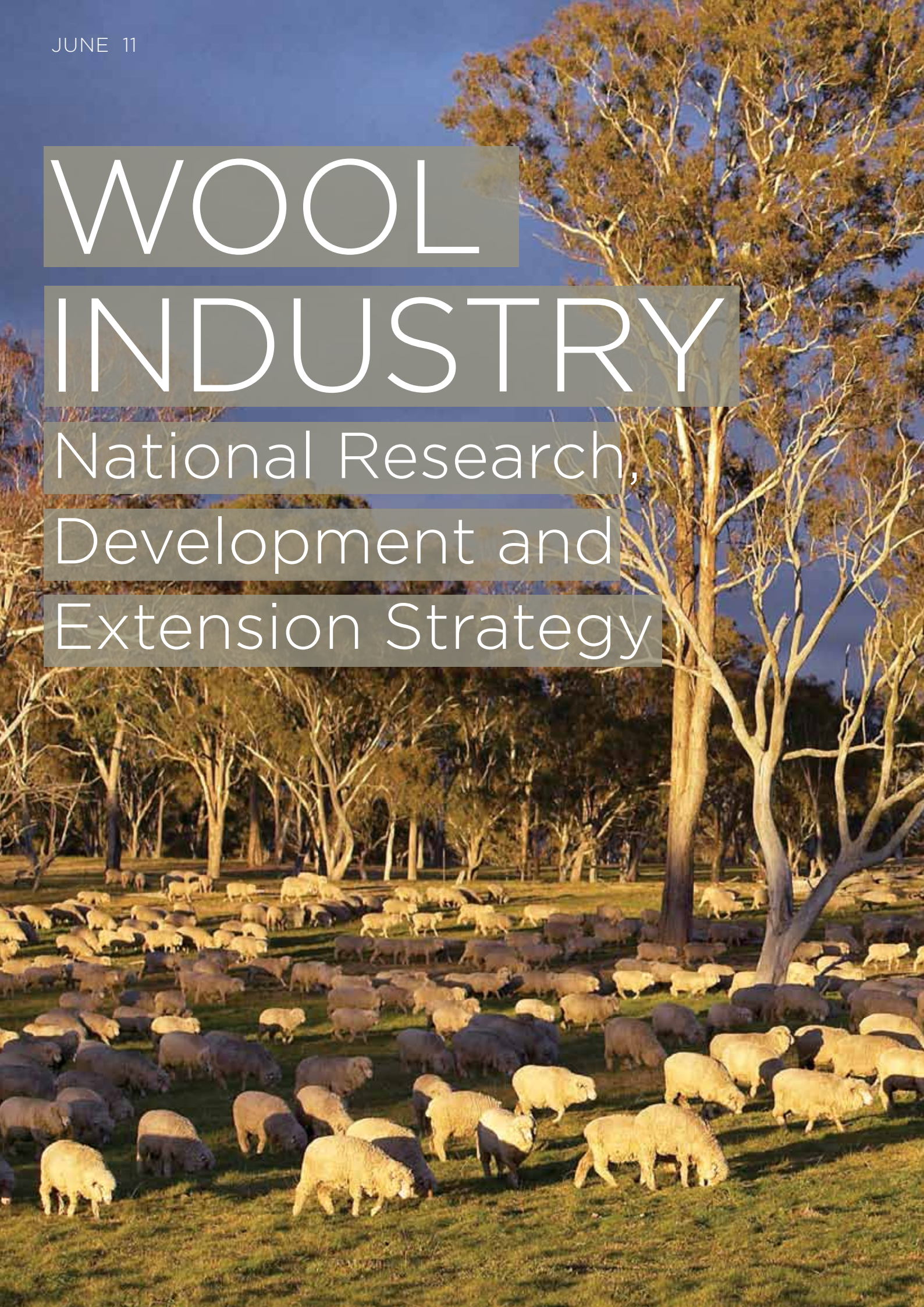


JUNE 11

WOOL

INDUSTRY

National Research,  
Development and  
Extension Strategy





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# EXECUTIVE SUMMARY

## WOOL SECTOR OVERVIEW –CHALLENGES FOR RESEARCH DEVELOPMENT AND EXTENSION.

In 2011, the Australian wool industry emerged from a prolonged period characterised by a significant decline in production driven by widespread drought and a price decline. For the first time in more than a decade the Australian wool clip is expected to increase to a predicted national volume of 345mkg (greasy). At the same time the Eastern Market Indicator has returned to levels not seen since the 1990's. ABARES summary of Australian statistics for wool 2010-2011 reports the total value of greasy exports at \$2.4 billion and semi-processed exports at \$250 million. Increased consumer demand for wool reflects recovery from the Global Financial Crisis, price increases for cotton and synthetic fibres, the perceived physical and natural advantages of wool over its competitor fibres and favourable fashion trends.

The Australian wool industry is now poised to capitalise on both the improved consumer demand and current favourable production climate. However to fully realise its potential, the wool industry must achieve improvements in production efficiency and product innovation. The challenges are many.

In the area of **wool production**, management systems are required that improve labour efficiency, fibre quality, parasite management and reproductive efficiency. Genetic tools and selection systems are necessary to further accelerate rates of genetic improvement. The welfare of wool producing sheep must be enhanced by reducing, replacing or refining invasive husbandry practices

and decreasing on-farm mortality. Wool harvesting efficiency and clip quality needs to be improved through new and better wool harvesting systems.

In the area of **supply chain management and demand growth**, product, processing and manufacturing innovations are required to deliver new products to market more efficiently. Supply chain logistics need to be improved by reducing post harvest costs and improving the efficiency of wool selling systems. Consumer confidence in woollen products must be enhanced through better definition of customer requirements. Provenance and verification systems are necessary for future animal welfare and environmental credentials. Quality assurance and supply chain declarations are required to support marketing claims.

In the area of **wool industry resilience and growth**, market access must be protected by effective biosecurity systems and enhanced product integrity. Wool enterprises need to become even more resilient by adapting production systems to future climate variability and actively participate in carbon and other environmental markets. Production systems need to preserve the natural resource base while making optimal use of it for wool production. The wool industry must think strategically to take advantage of opportunities and respond to threats. Woolgrowers will need to be supported as they develop the new skills and knowledge they need to become a profitable and sustainable wool industry producing the world's best natural fibre.

## NATIONAL WOOL RD&E STRATEGY AND ITS LINKAGES

These challenges are best met through a well planned and efficiently delivered national approach to investment in research, development and extension. This National Wool Research, Development and Extension (RD&E) Strategy has been prepared at the request of the Australian Primary Industries Ministerial Council, by the National Wool RD&E Working Group.

A national framework for wool RD&E will increase efficiency by addressing the following opportunities for improvement among wool industry R,D&E participants:

- Developing a formalised calendar for dialogue between the agencies represented on the Working Group to discuss project ideas, resource availability, strategic industry outcomes and collaborative opportunities across all priority areas
- Facilitate an agreed program framework for the wool industry under which all wool RD&E participants objectives, measures of success and activities (current and planned) have been mapped
- Promote sharing of information about the investment in RD&E of each wool industry RD&E participant
- Progress an inventory shared between wool industry RD&E participants regarding collaborative projects beyond that reported to the CRRDC

The challenges listed above were identified as important to wool growers, the Commonwealth and State governments, CSIRO and universities, through a process of consultation and by comparison of existing strategic plans. The alignment of priorities for all agencies and organisations involved in delivering wool RD&E is strong. The similarities between priorities and the tight scope of priorities across organisations, whose plan timeframes extend from 2009 to 2014, have facilitated the development of common wording to describe these areas as programs within a Program Framework approach for the National Wool RD&E Strategy during its implementation phase.

The transition to implementation will occur in the first financial year (11/12). The development of programs under the National Wool RD&E Program Framework will be facilitated by an annual RD&E investor forum hosted by the lead organisations to augment an existing annual forum for growers hosted by AWI. The forum will provide an annual opportunity for investors to share ideas and plans, identify opportunities for collaboration and prioritise the allocation of their RD&E resource. Existing investments will be aligned to the Wool RD&E Program Framework to help prioritise future work. Projects to support the outcome of the Program Framework will be designed by Technical Groups after each annual forum with reference to the National Wool RD&E Working Group and existing AWI producer reference groups, and the Sheepmeat Production Strategy's Red Meat Co-investment Committee.

Investors in wool industry RD&E are involved in other national sector specific and cross sector RD&E strategies such as the National Sheepmeat Production Strategy, the National Animal Welfare Strategy, the National Biosecurity Strategy and the Climate Change Research Strategy for Primary Industries. Involvement in these strategies will enable linked investment and access to a broader pool of ideas and knowledge.

## STRATEGY LEADERS

Australian Wool Innovation (AWI), the Western Australian Department of Agriculture and Food (DAFWA) and the NSW Department of Primary Industries (NSW DPI) have been identified as major organisations driving the implementation of the activities and in the delivery of programs under this framework. Support will come from the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE). The contribution of these organisations to

this strategy reflects the significance of their own interests in the wool industry. With only two state agencies identified as major agencies for wool RD&E (DAFWA covering Mediterranean and rangelands environments in the west and NSW DPI covering summer or winter high rainfall and rangelands in the east) and only one support agency in DPIPWE, there is a ready made East/West focus for expertise, coordination and efficiency of resource use, retention of key resources and infrastructure, rationalisation of investment evaluation, coordination of program development, initiation and management of projects and succession planning to retain required expertise in the wool industry.

With only AWI identified as a major agency for off-farm interests and with the significant component of these being conducted off shore, AWI will be the focus for delivering efficiencies and information relevant to the off-farm investments.

## PROGRAM FRAMEWORK

The Wool RD&E Program Framework consists of three programs:

1. Wool production;
2. Wool supply chain management and;
3. Demand growth and wool industry resilience and growth.

These three program areas are necessary for the profitable and sustainable production of the world's best natural fibre into the future.

# NATIONAL WOOL RD&E STRATEGY 2011–2030

## VISION

A profitable and sustainable Australian wool industry producing the world's best natural fibre.

## NEEDED TO ACHIEVE THIS VISION IS

A highly efficient and effective wool RD&E sector, undertaking collaborative investment and capability planning, to develop and deliver technology and systems that improve wool production, supply chain management, demand growth and industry resilience.

## NATIONAL WOOL RD&E PROGRAM FRAMEWORK

Programs are the identified priority areas for the wool industry, and have been identified as the major investment areas for wool industry RD&E 2011-2030.

Subprograms are the components of the programs and contain specific areas for investment for wool industry RD&E.

	Program 1: Wool production	Program 2: Wool supply chain management and demand growth	Program 3: Wool industry resilience and growth	National Sheepmeat Production RD&E Strategy - common Strategic Imperatives
<b>Subprogram</b>	1.1 Attaining best practice on-farm management for wool production through: Increasing labour efficiency Improving Merino management practices to increase the proportion of the clip that meets market requirements for physical fibre quality Improving parasite management practices for increased health and productivity Improving management systems to increase Merino reproductive efficiency	2.1 Innovating product, processing and manufacturing through: Delivering new products to new markets Improving cost efficiency	3.1 Protecting market access through: Effective biosecurity systems Enhancing product integrity	Increasing cost efficiency and productivity (including adaptability and risk management) Developing new and existing markets Enhancing food safety, product integrity and biosecurity

	Program 1: Wool production	Program 2: Wool supply chain management and demand growth	Program 3: Wool industry resilience and growth	National Sheepmeat Production RD&E Strategy - common Strategic Imperatives
<b>Subprogram</b>	1.2 Accelerating genetic gains of Merino sheep through: Genetic tools and selection systems improving reproductive efficiency in Merino flocks Genetic tools and selection systems improving parasite resistance Genetic tools and selection systems improving commercially valuable fibre quality and fibre growth traits Genetic tools with genomics enhancements Realizing the benefits of genetic tools	2.2 Improving supply chain logistics through: Reducing post harvesting costs Improving the efficiency of the wool selling systems	3.2 Enhancing wool enterprise resilience through: Adaptation of wool production systems to climate variability (seasonal) and climate change (decadal) Participation of wool enterprises in carbon and environmental markets with positive business outcomes Skills and knowledge building within a systems approach to wool production	Enhancing integration and value adding in supply chains (including cost efficiency) Increasing natural resource use efficiency and reducing environmental impacts
<b>Subprogram</b>	1.3 Enhancing welfare of wool producing sheep through: Reducing, replacing or refining the use of invasive husbandry procedures Reducing on-farm sheep mortality	2.3 Strengthening consumer confidence in woollen products through: Objectively measuring for sensory elements Defining consumer requirements and monitoring understanding and satisfaction Meeting consumer requirements for the characteristics of woollen products Improving product quality	3.3 Building environmentally sustainable wool enterprises through: Supporting management systems that preserve the natural resource base Supporting optimal pasture productivity and grazing management	Aligning animal welfare practices with consumer and community expectations
<b>Subprogram</b>	1.4 Improving wool harvesting and clip quality through: Furthering alternate wool harvesting technologies Improving the efficiency of the wool harvesting systems		3.4 Building wool industry strategic thinking through: Strengthening value propositions for wool growing Strategic responses to industry threats Wool forecasting systems	

## DEFINITIONS

### CHANGE STRATEGY

A Change Strategy is a plan to achieve the National RD&E Framework outcomes of reduced capability gaps, reduced fragmentation and reduced duplication.

### DEVELOPMENT (D)

Development is the application of knowledge gained through basic and applied research to create new or improved materials, products, processes and services, commonly through partnerships with commercial entities in the supply chain.

### EXTENSION (E)

Extension is the field of communication, information exchange and promotion of learning in order to build capability and change practice. It includes a wide range of communication and promotion tools and activities, and encompasses the roles of advisory or consultant services, field days and update events. Extension includes the development of practice change methodologies required to achieve high levels of adoption of research outcomes. It is recognised that the tools and delivery mechanisms will by nature be diverse and vary according to the intended outcome sought, the target segment of the industry, and the local situation.

### MAJOR-SUPPORT-LINK

These terms have specific definition in this Strategy document based on the definitions developed by the PISC R&D Sub-Committee for the role of agencies and jurisdictions under the National RD&E Framework.

**Major:** Take a lead role by providing significant R&D effort through maintenance of capability and leadership to deliver national R&D outcomes.

**Support:** Contribute to R&D in partnership but the major role will be taken by another agency.

**Link:** Undertake little or no R&D but access information and resources from other agencies (E only).

### NATIONAL RD&E FRAMEWORK

The National RD&E Framework will facilitate greater coordination among the different Commonwealth, State governments, CSIRO, RDCs, industry and university sectors to better harmonise their roles in RD&E related to primary industries and assure that they work together effectively to maximise net benefits to Australia.

The National RD&E Framework supports a strong culture of collaboration and coordination between the bodies, strengthens national research capability to better address sector and cross sector issues and focuses research, development and extension (RD&E) resources so they are used more effectively, efficiently and collaboratively, thereby reducing capability gaps, fragmentation and unnecessary duplication in primary industries RD&E. An agreed Change Strategy is identified in the National Wool RD&E Strategy.

### NATIONAL WOOL RD&E STRATEGY

The National Wool RD&E Strategy is a plan to deliver the outcomes of the National RD&E Framework using a Change Strategy and a Program Framework.

### PROGRAM FRAMEWORK

Programs deliver agreed outcomes for the wool industry from RD&E. Programs contain a suite of projects prioritised as steps in the delivery of the program outcome. Programs are the primary structural vehicles for research investors and providers to deliver benefits or services to achieve the intended outcomes. Agreed programs are identified in the National Wool RD&E Strategy. The Program Framework is expected to be able to be reviewed for currency during the implementation of the National Wool RD&E Strategy.

### RD&E

The continuum that extends from research (R) through experimental development (D) to extension (E) of the regionally interpreted and validated research.

### RESEARCH (R)

Research encompasses the following definitions adopted by the Productivity Commission (Productivity Commission 2007, Public Support for Science and Innovation, Research Report, Productivity Commission, Canberra):

- Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application of use in view
- Applied research is also original investigation undertaken to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective

### SUPPLY CHAIN/VALUE CHAIN

Supply chains are the set of entities directly linked by the upstream and downstream flows of products, services, finances, and information from a source to a customer. The concept of a value chain puts the emphasis on the set of activities within a supply chain that add value to the end product that is ultimately presented to the consumer. Identifying the value chain allows a business to refine its operations in an effort to improve quality, add efficiencies, and increase profits.

### WORKING GROUP

The Working Group is the National Wool RD&E Working Group of wool industry RD&E participant representatives who developed the National Wool RD&E Strategy.



# ACRONYMS

<b>ACDA</b>	Australian Council of Deans of Agriculture
<b>ABARES</b>	Australian Bureau of Agricultural Resource Economics and Sciences
<b>ABS</b>	Australian Bureau of Statistics
<b>AWI</b>	Australian Wool Innovation Ltd
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation
<b>CSU</b>	Charles Sturt University
<b>CRC</b>	Cooperative Research Centre
<b>CRRDC</b>	Council of Rural Research and Development Corporations
<b>D</b>	Development
<b>DAFF</b>	Department of Agriculture, Fisheries and Forestry
<b>DAFWA</b>	Department of Agriculture and Food, Western Australia
<b>DPIV</b>	Department of Primary Industries, Victoria
<b>DEEDI</b>	Department of Employment, Economic Development and Innovation, Queensland
<b>NSWDPI</b>	New South Wales Department of Primary Industries
<b>DPIPWE</b>	Department of Primary Industries, Parks, Water and Environment, Tasmania
<b>DRPI</b>	Department of Resources – Primary Industry, Northern Territory
<b>E</b>	Extension
<b>FFI</b>	Future Farm Industries Co-operative Research Centre
<b>FTE</b>	Full time equivalent
<b>FY</b>	Financial year
<b>IACRC</b>	Invasive Animals Co-operative Research Centre
<b>IWTO</b>	International Wool Textile Organisation

<b>MLA</b>	Meat and Livestock Australia
<b>NSW</b>	New South Wales
<b>NT</b>	Northern Territory
<b>NWD</b>	National Wool Declaration
<b>PIMC</b>	Primary Industries Ministerial Council
<b>PIRSA</b>	Department of Primary Industries and Resources South Australia
<b>PISC</b>	Primary Industries Standing Committee
<b>Qld</b>	Queensland
<b>R</b>	Research
<b>RDC</b>	Research and Development Corporation
<b>R&amp;D</b>	Research and Development
<b>RD&amp;E</b>	Research, Development and Extension
<b>RMIT</b>	Royal Melbourne Institute of Technology
<b>SA</b>	South Australia
<b>SARDI</b>	South Australian Research and Development Institute
<b>TIAR</b>	Tasmanian Institute of Agricultural Research
<b>UAdelaide</b>	The University of Adelaide
<b>UMelbourne</b>	University of Melbourne
<b>UNE</b>	University of New England
<b>USydney</b>	University of Sydney
<b>Vic</b>	Victoria
<b>WA</b>	Western Australia





# 1 INTRODUCTION

## 1.1 CONTEXT

**Adoption of innovation has been recognised as key to improving productivity and competitiveness in the primary industries sector, and making the best use of Australia's natural resources under a changing climate.**

**In April 2005, PIMC endorsed a concept of national research with regional development and local extension, recognising that basic and strategic research (R) can be provided from a distance, with regional adaptive development (D) and local extension (E) required to improve the uptake of innovation by industry. PIMC and the RDCs signed a Statement of Intent containing a set of principles, with the intent of facilitating greater coordination among the different RD&E providers to better harmonise their roles in RD&E to improve the efficiency and effectiveness of the national RD&E capability.**

### The agreed principles were:

1. The Parties will cooperate to encourage the establishment of a more efficient and effective RD&E system nationally.
2. 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 the national system in priority areas.
3. The Parties will share information, plans and priorities for investment in RD&E to facilitate development and implementation of the Framework and underpinning sector and cross sector strategies.
4. The Parties will facilitate access to national research capability (people, infrastructure and information) by industry and R&D partners across Australia.
5. 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.
6. The Parties recognise the importance of investing in extension of R&D to facilitate rapid uptake of research and innovation.
7. The Parties agree to work cooperatively to improve the administrative processes and effectiveness of information sharing and management.
8. 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.
9. 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.

In April 2007 PIMC further agreed to a National RD&E Framework to provide a more formal and comprehensive structured approach within an agreed timeframe. This National RD&E Framework aims to facilitate greater coordination among the Commonwealth, State Governments, CSIRO, RDC, industry and university sectors to harmonise their roles in national RD&E; strengthen national research capability to better address sector issues; and to reduce capability gaps, fragmentation and duplication of national RD&E.

Fourteen sector strategies and seven cross sector strategies will form schedules to the Framework. These are:

- Sector strategies: beef, cotton, dairy, fisheries and aquaculture, forestry, grains, horticulture, pork, poultry, sheep meat, sugar, wine, wool, new and emerging industries
- Cross sector strategies: climate change, food and nutrition, animal biosecurity, plant biosecurity, animal welfare, biofuels and bioenergy, water use in agriculture

The Wool Strategy has significant allied interests and alignment with a number of these strategies; particularly sheep

meat, animal welfare, animal biosecurity, and climate change.

## 1.2 NATIONAL WOOL RD&E WORKING GROUP MEMBERSHIP

The National Wool RD&E Strategy was developed with the oversight and contribution of a National Wool RD&E Working Group (the Working Group), containing representatives from all State agencies, the Wool Industry RDC,

Australian Wool Innovation (AWI), CSIRO, Commonwealth and the University sector. The Department of Agriculture and Food, Western Australia (DAFWA) and AWI led the Strategy development.

### The National Wool RD&E Working Group members are:

<b>Professor David Cottle</b>	ACDA
<b>Dr Karen Dowd</b>	DAFWA (Western Australia)
<b>Alex Russell &amp; Dr Sue Hatcher</b>	NSW DPI (NSW)
<b>Tim Hollier</b>	DPI V (Victoria)
<b>Peter Johnston</b>	DEEDI (Queensland)
<b>Dr Jane Littlejohn</b>	AWI
<b>Professor Simon Maddocks</b>	SARDI/ PIRSA (South Australia)
<b>Dr Ian Purvis</b>	CSIRO
<b>Robin Thompson</b>	DPIPWE (Tasmania)

We would like to recognise some other members of the National Wool RD&E Working Group, whose contribution during their membership was valued:

<b>Dr Kevin Chennell</b>	DAFWA (Western Australia)
<b>Dr Mark Dolling</b>	DAFWA (Western Australia)
<b>Casey Dunn</b>	DAFF
<b>Mary Goodacre</b>	AWI
<b>Allen Grant</b>	DAFF
<b>Elizabeth Howard</b>	DAFF
<b>Professor Phil Hynd</b>	University of Adelaide
<b>Dr Bruce Mullan</b>	DAFWA (Western Australia)
<b>Dr Chris Oldham</b>	DAFWA (Western Australia)
<b>Dr Greg Sawyer</b>	DAFWA (Western Australia)

<b>Usha Sriram-Prasad</b>	DAFF
<b>Dr Paul Swan</b>	AWI
<b>Greg Weller</b>	Wool Producers Australia
<b>Susan Wishart</b>	DAFF
<b>David Tester</b>	Sheep CRC

## 1.3 STAKEHOLDER CONSULTATION

The National Wool RD&E Strategy has been developed with comprehensive information from all its stakeholders.

Wool grower consultation was achieved through 8 workshops held in WA, NSW, Victoria and Tasmania and additional surveying of members of AWI's Leading Sheep and Sheep Connect grower networks in Queensland and South Australia respectively (Appendix 8.1). The outcomes requested by growers were distributed to grower representative bodies and posted for comment on the AWI website. Detailed workshop outcomes are available on AWI's website, at <http://www.wool.com/National-Research-Development-Extension-Strategy.htm>.

A draft version of the strategy was distributed to various producer groups. The Australian Superfine Woolgrowers Association provided the Working Group with a list of priorities from their biennial survey 2010/2012.

The strategic plans from the organisations represented on the Working Group were analysed and incorporated into this strategy document. These primarily represent on-farm interests. Consultation with

processor, manufacturer, designer and retail sectors of the wool industry was conducted as part of AWI's annual input to its own strategic plan. These have all been analysed to identify areas of alignment and similar strategic directions (in Section 4). Further, the 2005 AWI commissioned report titled "New Zealand Merino Supply Chain Business Model for Australia" (EC709) analysed both on and off-farm perspectives on the need for and suitability of alternate demand chain and risk management structures for the Australian wool industry. This report is still considered current by AWI and industry, and the findings were reinforced at some of the wool grower strategy workshops.

An audit on infrastructure and human resource capability by discipline was provided by each of the Working Group members for their organisation or constituency. The detail of this information is provided in Appendices 8.3-8.5.

An overview of the wool industry, its challenges and future predictions was delivered by commissioned wool industry expertise (Poimena Analysis) with input from AWI and the Working Group, and features in the Situation Analysis in this strategy document.



## 2 WOOL INDUSTRY SITUATION ANALYSIS

### 2.1 TRENDS AND FUTURE PREDICTIONS

#### 2.1.1 A modest recovery in the Australian flock size

The global sheep population has declined in the past twenty years from 1.20 billion head to 1.065 billion head, with many of the major wool producing countries seeing their national flocks fall (Graph 1). This has been the result of sheep producers in almost all countries shifting away from wool, either towards dual-purpose or meat sheep or to other agricultural enterprises (cropping, meat cattle, dairy cattle, forestry) as the result of an extended period of low wool prices and poor returns from wool production.

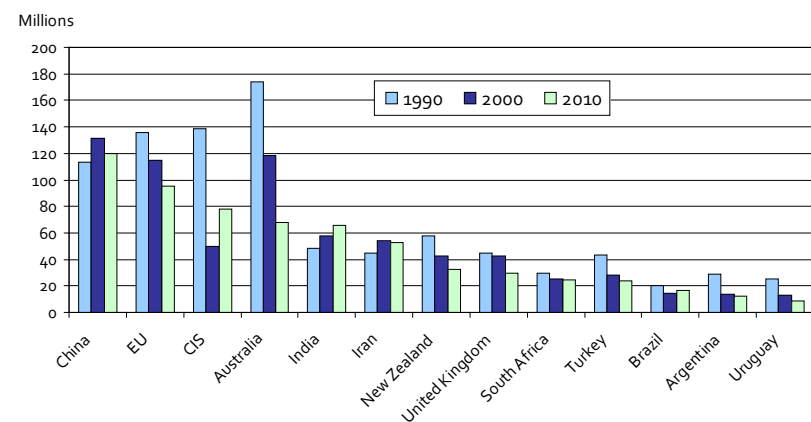
The largest decline in total sheep numbers occurred in Australia, with the national sheep flock falling from 170.2 million in 1990 to just 67.7 million head

in 2010. According to Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), this is the lowest level since 1887.

According to the Australian Bureau of Statistics (ABS), the proportion of ewes in the Australian flock reached 62% in 2010, the highest since at least 1979. The large Merino wether flocks that were a feature of the industry have disappeared shipped to the Middle East as a significant part of the live sheep export trade or slaughtered in response to the continued strong demand for sheepmeat.

Both ABARES and Meat and Livestock Australia (MLA) expect that the current level of sheep numbers signify the low point and predict that numbers will improve modestly over the next five years. This turnaround is due to much improved returns for sheep

### Global sheep population 1990, 2000, 2010



Source: International Wool Textile Organisation

Graph 1 World sheep population trends 1990 to 2000.

Reference: International Wool Textile Organisation, Market Information 2010

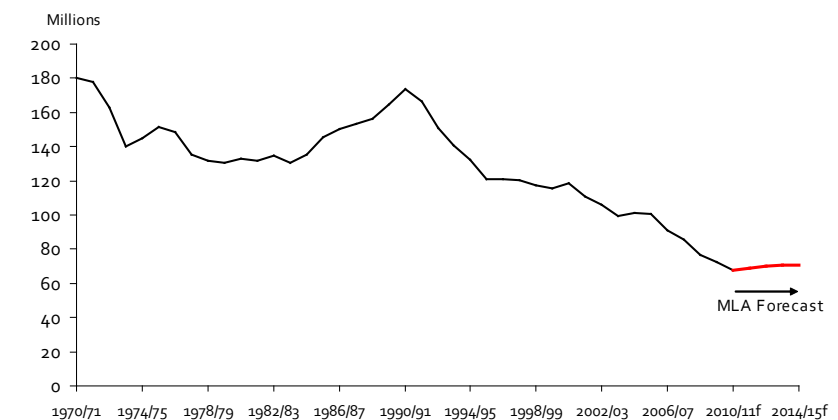
production, both from wool and meat, and recovery from drought. According to the ABARES Australian Agricultural and Grazing Industries Survey, sheep industry properties recorded a positive farm business profit in 2009/10 and are expected to record the highest farm business profit of all sectors in 2010/11. This will be the best result ever recorded by ABARES for sheep industry properties. Furthermore, ABARES and MLA both predict that opening sheep numbers for the 2011/12 season will be 69 million head, an increase of 1.9%. The trend in Australian sheep numbers and the MLA five year forecasts are shown in Graph 2.

#### 2.1.2 Wool production very low but expected to improve

The International Wool Textile Organisation (IWTO) estimates that world wool production in 2010 was 1,083 mkg clean, compared with 1,343 mkg clean in 2000 (a decline of 19%) and 2,007 mkg clean in 1990 (46%). The largest aggregate decline in wool production occurred in Australia, where shorn wool production fell from 1,029 mkg greasy in 1989/90 to 620 mkg greasy in the 1999/00 season and 343 mkg greasy in 2009/10, a decline of 66%.

The Australian Wool Production Forecasting Committee's latest forecast

### Australian sheep population Opening numbers 1970/71 to 2014/15f



Source: ABS, ABARES and MLA  
Sheep numbers are as at 1<sup>st</sup> July.

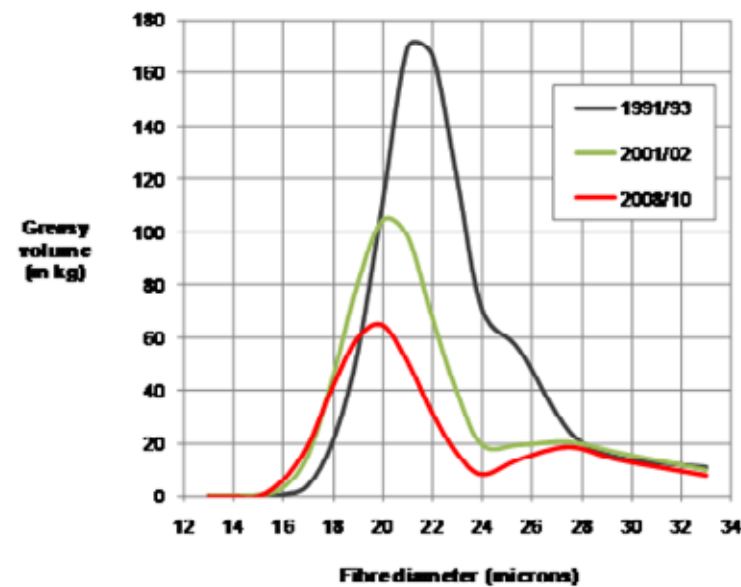
Graph 2 Australian sheep numbers and forecasts.

Reference: Australian Bureau of Statistics, ABARES, 2011 and MLA, 2011

for the 2010/11 season is 340 mkg greasy, and the Committee predicts that shorn wool production will increase in 2011/12 by 1% to 345 mkg greasy, reflecting an expected 1% lift in the number of sheep shorn.

The shift to fine and superfine Merino sheep seen in the first half of 2000s in Australia appears to have halted, largely due to lower superfine wool prices in the second half of that decade (Graph 3). The Australian Wool Testing Authority Limited reports that in the 2010/11 season, as a share of the total volume tested, superfine wool accounted for 17.7% of all wool tested which was the lowest share for this category since the 2005/06 season when it was 15.8%.

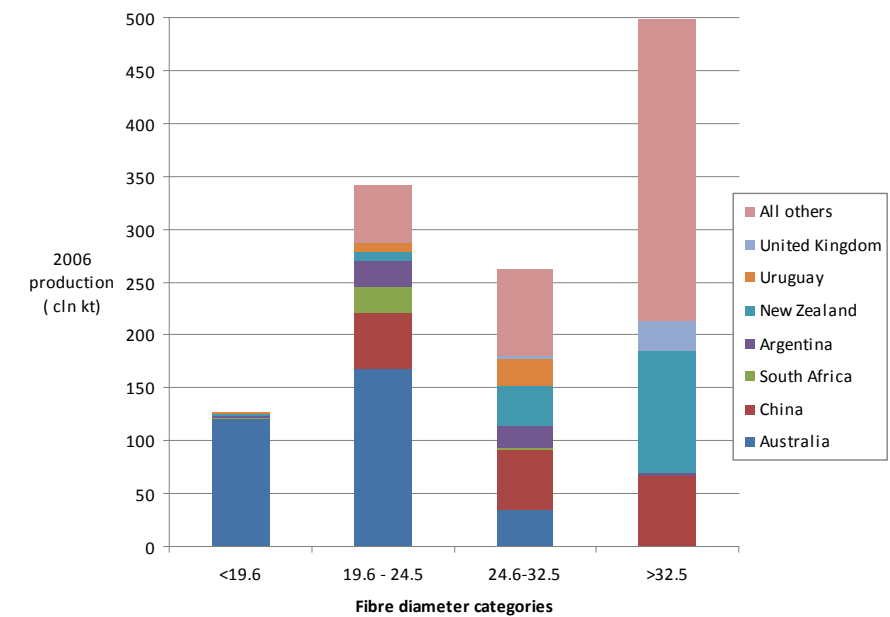
In spite of this decline, Australia's competitive advantage in world wool production remains in the production of apparel wools, particularly those 24.5 micron and finer. IWTO reports that Australia's share of world wool production in 2010 was 22% and it had a share of 43% of the world apparel wool production. Australia's share of world Merino wool production (24.5 micron and finer) was around 65% in 2010, and Australia's share of world superfine wool production (18.5 micron and finer) was 81% in 2009/10. AWI's estimates of Australia's share by micron category are shown in Graph 4.



Graph 3 Changes in the volume and micron of the Australian clip. Reference: AWTA

ABARES Australian Commodities quarterly (March 2011) predicts that Australian shorn wool production will improve slowly over the next five years from the low point in 2010/11 of a forecast 335 mkg greasy to 367 mkg greasy in 2015/16 (see Graph 5). Even

though sheep numbers are projected to rise by around 2% per year, the effect on wool production is predicted to be modest due to the changing composition of the Australian sheep flock in recent years (i.e. more ewes and fewer wethers).



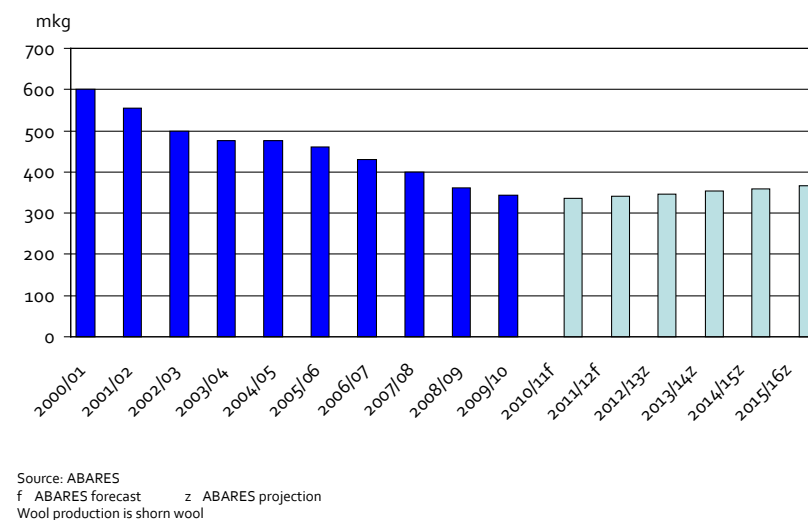
Graph 4 The micron profile of the world's major wool producing countries Reference: Australian Wool Innovation, 2009

### 2.1.3 Wool demand on a recovery path and prices near record levels

Consumer demand reflects a range of factors, including economic conditions in the major retail markets for wool

clothing, the price competitiveness of wool relative to synthetic fibres and other natural fibres, the perceived advantages of wool over its competitor fibres and fashion trends. Graph 6 shows the long term trends in price over the three major structural periods: i) Reserve

### Australian wool production



Source: ABARES  
f ABARES forecast z ABARES projection  
Wool production is shorn wool

Graph 5 Trends and projections for Australian wool production 2000/01 to 2015/16 Reference: ABARES, 2011



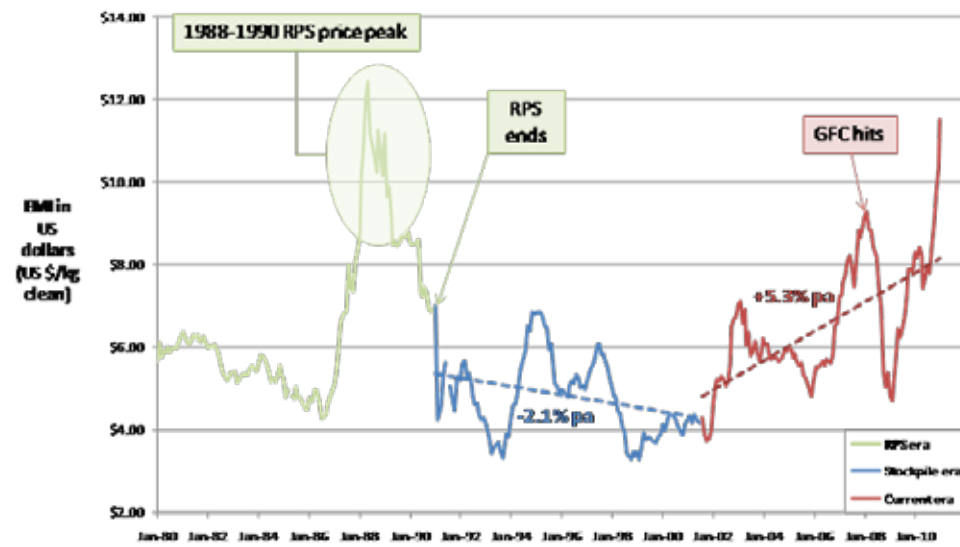
Price Scheme; ii) Stockpile rundown and; iii) Post stockpile recovery.

The IWTO, citing data from The Woolmark Company, reports that the major wool consuming countries at retail are China, the United States of America, Japan, the United Kingdom, Germany, Italy, South Korea and France. They accounted for 62% of world consumption of wool used in clothing. Of these eight countries, seven experienced a sharp economic slowdown or recession in 2009 in the wake of the Global Financial Crisis. Only China managed to avoid this sharp

economic slowdown, although even its economic growth was dampened.

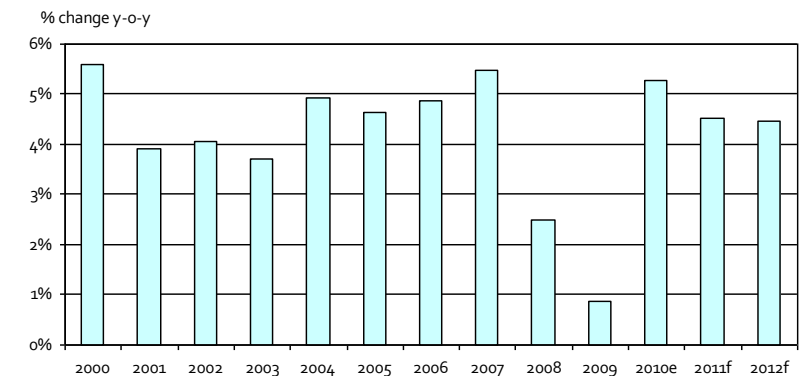
Graph 7 shows the trends in economic growth in these eight countries, weighted by their wool consumption, as reported by Michell Direct (2011). It shows the sharp drop in aggregate economic growth in 2008 and, particularly, in 2009.

Consumer confidence and retail sales of clothing fell as a result, and this flowed through the wool textile industry to decrease demand for raw wool. ABS statistics show that Australian exports



Graph 6 Long term trends in wool price 1980 to 2010  
Reference: AWEX, Reserve Bank of Australia (FX rates)

### Economic Growth in the Main Wool Apparel Consuming Countries



Source: IMF, Consensus Forecasts (February 2011) and Poimena Analysis  
Note: Economic growth in China, Japan, USA, UK, Germany, Italy, France and South Korea, weighted by apparel wool consumption (from Woolmark/IWTO)

Graph 7 Trends and projections in economic growth in the major wool consuming countries weighted by wool consumption  
Reference: Michell Direct, 2011

fell in calendar year 2009 as a result of this downturn in raw wool demand - 6% by volume and 19% by value in Australian dollars.

Economic growth rebounded in 2010 although retail sales of clothing were slower to respond because of continued high unemployment, particularly in the US. Nevertheless, ABARES reports that demand has improved in 2010/11, with growth in both the European Union and in the US. Retail sales of clothing in China increased by 25% in 2010 and ABARES reports continued growth in the demand for wool apparel products.

This has brought much stronger demand for Australian raw wool. In 2010, Australian wool exports increased by 20% in A\$ value, although exports only increased by 1% in volume (as continued low production constrained export volumes). While China remains the largest export destination for Australian wool (it accounted for 71% of Australian exports in the first seven months of the 2010/11 season), ABARES reports that it is demand from some European

countries that has been a major factor in this recovery. Exports to Italy and the Czech Republic increased by around 110% and 60%, respectively, in the first six months of 2010/11.

The combination of the much improved demand for wool and very low production (in Australia and globally) has resulted in a surge in wool prices in the 2010/11 season. Between the start of July 2010 and end of March 2011, the Eastern Market Indicator has risen by 54%, from 895 Acents/kg to 1,379 Acents/kg. The largest increases have come in the prices for superfine wool, with the 17 micron price guide increasing by 101%.

The season average for the EMI to March 2011 was 1,043 Acents/kg compared with an average of 872 Acents/kg in 2009/10. It is the highest seasonal average since the 1989/90 season.

ABARES predicts the average EMI for the full 2010/11 season will be 1,000 Acents/kg, about 15% higher than the 2009/10 average (ABARES March 2011).

ABARES expects that in the medium term the EMI will rise steadily in nominal terms, reaching a peak season average of 1,117 Acents/kg in 2015/16. ABARES notes that it assumes the Australian dollar will maintain a high value over the next five years, which is a major downside risk to the wool price projections. Even though wool prices have increased recently in spite of a strong Australian dollar, ABARES does not expect this to continue beyond the short term, mainly because of the projected increase in wool supplies over the medium term.

An important point is that ABARES' forecasts were prepared in January 2011, before the major surge in wool prices. As a result, current price levels and the season-to-date average are higher than expected by ABARES.

The recent and sustained increase in wool prices should bring better profitability to sheep producers and encourage them to rebuild their flocks.

According to IWTO (pers com) there will be an increased amount of promotion, marketing and consumer education of wool in the United Kingdom with the Campaign for Wool. This is in addition to the planned global marketing activities by Australian Wool Innovation. The end result will be increased consumer awareness and enthusiasm for wool products, possibly lifting consumer demand. As well, Michell Direct (pers com) reports that the mood among weavers at the major trade fairs was much improved as they prepared for the 2011 autumn/winter in the Northern Hemisphere and that there was increased interest in wool at the fairs. This could bring higher orders for the wool textile pipeline and strong demand for raw wool in preparation for the autumn/winter season.

A feature of the recent market conditions has been that wool prices have been rising in spite of the Australian dollar being at parity or higher with the US dollar. As a result, the EMI is at record high levels in US dollar terms. This has meant that the value of Australian wool exports in US dollars has risen by even more than in Australian dollars. For the seven months of the 2010/11 season to January, Australian wool exports are 35% higher in US\$ than in the same period in 2009/10.

### 2.1.4 Wool remains competitive with other fibres

Cotton prices (as measured by the CotLook A Index) have increased by 173% between July 2010 and March 2011 and have been at all-time record high levels since November 2010. The Forward CotLook A Index for the 2011/12 season, while lower than current levels, are still twice the price prevailing in July 2010. As a result and in spite of the record prices (in US\$) for wool, the relative price between 21 micron wool and cotton has declined in 2010/11 to just 2.49 to 1 (i.e. wool is 2.49 times the price of cotton). This compares with a ten year average of 4.55 to 1. This makes wool relatively more attractive for fabric makers compared with cotton.

Polyester staple prices have increased by 46% since July 2010, viscose prices have risen by 52% and acrylic prices have increased by 15%. Polyester staple and viscose prices have risen due to higher demand as mills seek alternatives to cotton given the extreme cotton prices (PCI Fibres and Raw Materials).

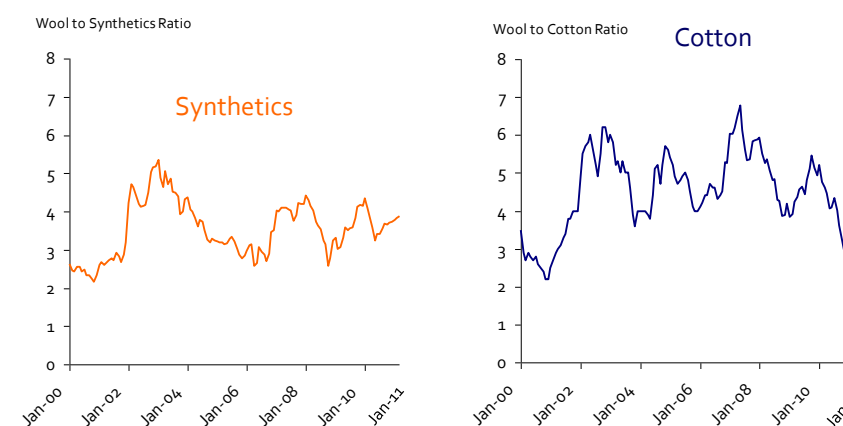
As the result of these price increases and those for wool, the price relativity between wool and synthetic fibres has increased from 3.40 to 1 in July 2010 to

4.23 in March 2011. In spite of this increase in wool's price relative to synthetics, wool is still comparatively competitive with synthetic fibres (Graph 8).

Global fibre volume is increasing rapidly, driven by cotton and synthetic fibre production. The annual production levels

of both cotton and synthetics dwarf the annual production of wool, with world cotton production in 2009 being 23,300 mkg, while world production of synthetic staple fibre was 15,700 mkg. Wool production totalled 1,098 mkg (Graph 9). Australian wool now represents around 0.5% of the global fibre market (all

## Wool's Price Competitiveness US\$ terms



Source: AWEX, Cotton Outlook, PCI Fibres, CIRFS, Woolmark, Poimena Analysis Data to March 2011

Graph 8 Medium term price relativities for wool, synthetics and cotton Reference: Michells Fibre Direct, March 2011

wool), and this will inevitably continue to decline (Graph 10). Wool cannot compete on volume. For this reason, wool must compete on quality, not quantity.

### 2.1.5 Consumer expectations

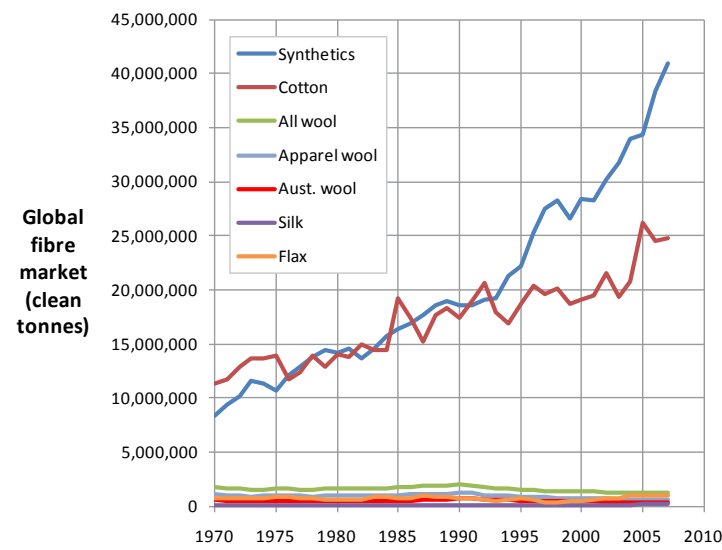
Consumers in the major developed countries are becoming increasingly concerned about the way in which the products that they buy and consume are produced. Ethical production has many dimensions, including labour conditions, fair trade, environmental sustainability and animal welfare standards. These concerns are most pronounced among consumers in Western European countries, although retailers in the USA are also keenly

interested in these issues. However, there is little evidence of mainstream retailers or consumers being prepared to pay extra for environmental credentials.

### 2.1.6 Wool harvesting

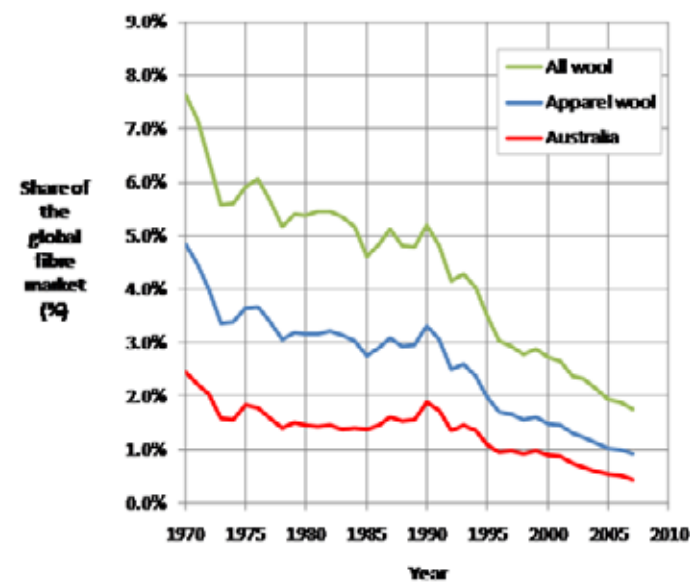
The cost of wool harvesting is by far the single biggest sheep-to-mill cost for Australian sheep producers. The most recent available data (for the 2009/10 season) from AWI shows that shearing costs accounted for 36.9% of all of the direct costs paid by woolgrowers in delivering their wool to market and 14.5% of the average greasy wool prices achieved in 2009/10.





Graph 9: Changes in the Australian share of the global fibre market since 1970

Reference: AWI



Graph 10: Changes in the Australian share of the global fibre market since 1970

Reference: AWI

Furthermore, shearing costs are increasing much more quickly than the inflation rate, and pose a significant threat to the long term viability of the wool industry (AWI, 2007). Many of these costs are related to workplace injuries.

### 2.1.7 Wool selling

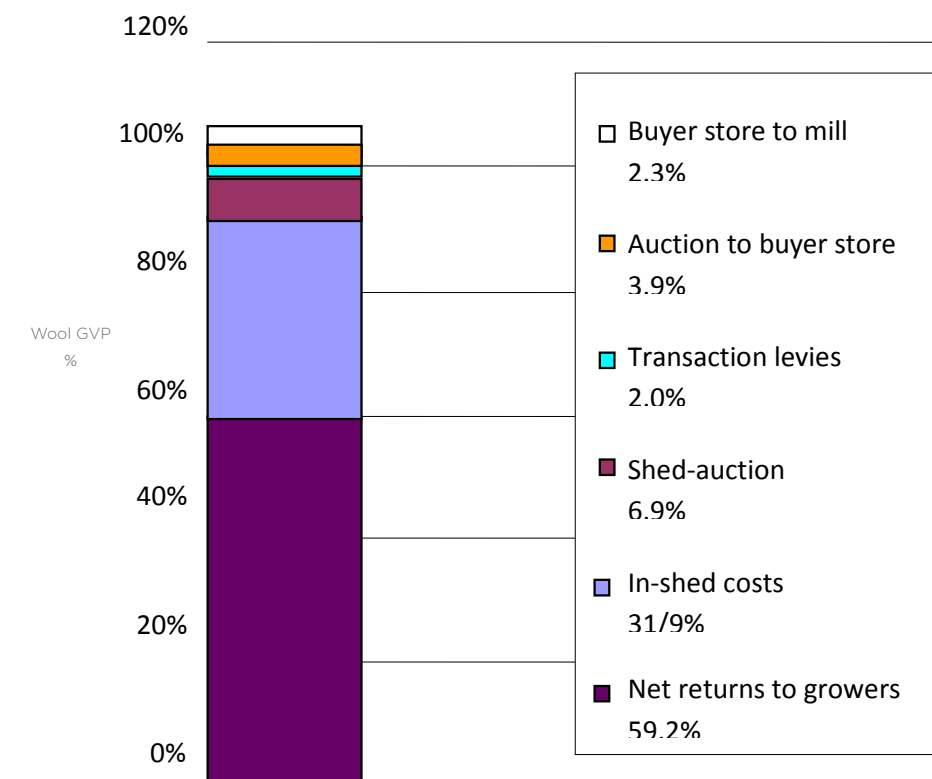
Post shed to ship processes have not changed markedly since the 1980s. Costs directly borne by growers amount to around \$1.05 billion per annum (AWI, 2007) comprising: \$650M pa in-shed (e.g. Shear/crutch), \$218M pa shed-auction and \$187M pa auction-ship. Effectively 40% of the total value of the Australian wool clip is the costs of getting the fibre from the sheep to the ship, demonstrated in Graph 11.

Broker charges dominate the costs incurred from post shed to buyer store (approximately 43%) (Graph 12). These comprise mostly of \$52M pa

warehousing/insurance, \$43M pa in buyer charges and \$25M pa in commissions. Most of the broker charges simply reflect bale storage and handling services provided to the grower and buyer. The cost of this service is substantial (approximately \$80M pa or \$32 per bale) and is partly hidden in the post sale service charge directed at buyers.

### 2.1.8 Environment and climate variability

Woolgrowers face increasing pressure from consumers and the community to reduce soil degradation, maintain or improve biodiversity and perenniality, manage waterways and native vegetation for private and public good outcomes and to mitigate greenhouse gas emissions. Attempts to meet these expectations are complicated by a variable and changing climate and the need for woolgrowers to remain financially viable.



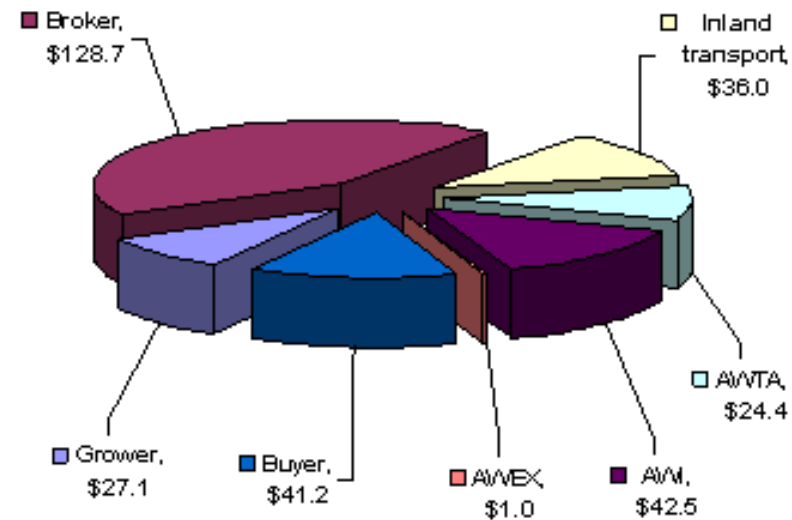
Graph 11 Percentage breakdown of shed to ship costs as a total of GVP

Reference: AWI Sheep's Back to Mill Dec 2009

The Australian government has proposed policies that will impose a cost on greenhouse gas emissions (i.e. a carbon tax). Whilst the detail of this tax is yet to be finalised it is likely to add to the

costs of wool production and impose increased complexity on sheep raising and wool production. Furthermore, there is an increasing focus globally on climate change and greenhouse gas emissions,

**Contribution to shed-buyer store costs (\$m pa)**



Graph 12 Contribution to shed-buyer store costs (\$M pa)  
Reference: AWI Sheep's Back to Mill Dec 2009

with consumers seeking quantified information on the environmental footprint of products.

The reduced availability of irrigation water, particularly throughout the Murray Darling Basin, may result in stock

water becoming a limiting resource for south-east Australian wool producers. However, where the security of irrigation water supplies can no longer be guaranteed, new opportunities may arise for wool production.

## 2.2 FUTURE WOOLSCAPES

Through the Future Woolscapes program in 2006, AWI commissioned report on the future of the wool industry

focusing on the challenges, threats and opportunities that lie ahead in 20 to 30 years' time. This report identified the following issues for the industry:

1. Industry politics and disharmony are a real threat to the industry—a united vision for the Australian wool industry is needed.
2. Incremental gain across the industry may not be sufficient to avoid significant restructuring.
3. Sustainable resource use and animal welfare are becoming increasingly important.
4. The ability to track fibre through the pipeline may well be required.
5. A likely move to further agricultural specialisation and potentially a significant relocation of wool production, especially into the less arable areas.
6. The potential for wool and sheep meat production to diverge.
7. The scale of the enterprise, ownership structure and skills required is likely to alter.
8. The need for labour saving technology on-farm.
9. Productivity and quality improvements in both production and processing will be critical: new technologies need to be harnessed and "paradigm change" solutions found.
10. The location of processing may well alter, especially wool scouring.
11. Consumer markets will change.
12. New wool products that meet these changing consumer needs and expectations will be paramount (value, individuality, immediateness, well-being and confidence, comfort, security and welfare and environmental assurance).

A vigorous and innovative research and development program was identified through this process as critical to best

equip the wool industry for the future, as was a sense of direction and a clear vision for the industry.



# 3 CURRENT WOOL RD&E INVESTMENT AND CAPABILITY

## 3.1 INVESTMENT

The investment in Australian wool RD&E (on and off-farm) human resources for 2009/10 has been estimated to be \$11,013,490. Further estimation of costs of this human resource investment using a 2.6 multiplier to account for all facilities and assets apportioned to wool industry RD&E is \$28,635,074. These figures have been calculated from the estimated average base FTE value for wool professionals and a multiplier for estimated on-costs.\*

It is recognised that it is difficult to accurately differentiate activities and apportion investment specific to wool from those of interest to the sheepmeat industry. During the implementation phase of this strategy and the sheepmeat strategy, and as investment programs specific to wool become apparent, it will be more efficient and more accurate to define wool only investment.

An analysis of the human resource audit revealed that AWI does not currently have investment in all wool RD&E services provided by all agencies.

(\* Figure is based on a NSW DPI model for determining investment in wool RD&E, using an average base salary figure of \$76,557, weighted by the proportion of each individual salaries time devoted to wool industry issues. Further multipliers of 2.6 is used to estimate costs of wool industry RD&E, being all facilities and assets.)

## 3.2 HUMAN RESOURCES

The human resources capability of the national wool RD&E effort was collated through an audit and analysis process. This data was collected and collated for the 2009/10 financial year but has been revised by all members of the Working Group to reflect the current period (2010/11). The data is summarised in the tables below and complete data can be found in Appendix 8.3. The key data drawn from this analysis is outlined below.

### 3.2.1 On-farm wool RD&E human resource capability

- 132 full time equivalent staff (FTE) are involved in on-farm wool related RD&E in the state agencies and universities with 53% of FTEs in the fields of education and extension, animal breeding and genetics, and parasitology **(Table 1)**
- Farming systems areas collectively make up 13.4% of national capability (14.8 FTE)
- Less than 2% of national wool RD&E capability is targeted at farm/rural management and agribusiness (0.3%, 0.4 FTE); sustainable development (1.3%, 1.7 FTE); and agricultural economics (0.8%, 1 FTE)

### On-farm RD&E strengths for agencies

- The Universities combined make up the largest contributor to national wool RD&E on-farm capability (25.9%, 34 FTE). However, when separated into the individual organisations, their individual contribution is no more than 9.3% of the national on-farm capability
- The State agencies with the largest on-farm wool RD&E capability are NSW DPI (24.6%, 32 FTE) and DAFWA (17.5%, 23 FTE)
- The areas with the heaviest focus for both States are education and extension (NSW, WA) and animal breeding and genetics (WA)

### On-farm RD&E strengths for AWI

- AWI estimates its on-farm RD&E investments support the activities of 71% of the Agency FTEs for on-farm capability, to some degree (value not quantified in this analysis)
- AWI's major investment is in a range of disciplines in animal health and welfare, genetic gain and education and extension **(Table 2)**. The disciplines which can have a major impact on wool issues (e.g. flystrike, lice, animal welfare) are strongly supported by AWI, while those that are general sheep issues are shared investments with MLA (e.g. nutrition, reproduction and natural resource management) and have minor support

**Table 1. Major discipline areas of national on-farm wool RD&E capability**

AREA	% OF FTE	NUMBER OF FTE
Education and extension	30%	39
Animal breeding and genetics	12%	15
Parasitology	11%	14
Plant improvement	6%	8
Animal nutrition	5%	6
Agronomy	5%	6
Animal husbandry, welfare and behaviour	5%	7
Animal growth and development	4%	6
Animal production	4%	5
Animal reproduction	4%	5

**Table 2. AWI investment support for national on-farm wool RD&E capability**

LARGE	SMALL
Breeding and genetics	Natural resource management, sustainable development
Husbandry, welfare and behaviour	Nutrition
Parasitology	Agronomy
Pasture	Climatology
Production	Biosecurity
Medicine	Other veterinary disciplines
Education / Extension	Quality management
Business information systems	
Economics	

**3.2.2 Off-farm wool RD&E human resource capability**

- 12 full time equivalent staff are involved in off-farm wool related RD&E in the state agencies and universities
- Only five agencies are involved with, and have capability in, off-farm wool RD&E
- Only three disciplines are identified in off-farm wool RD&E nationally
- Textile technology dominates the national off-farm wool RD&E

capability, with some effort in manufacturing engineering and to a lesser extent quality management (Table 3)

- These figures only include Australian capability. The international resources used by AWI are much larger as they are sustained by the dominance of wool processing, manufacturing and retailing needs outside of Australia
- AWI has an Australian based in house staff capability in fibre and textile research (4 FTE) and quality management (2 FTE)

**Table 3. Discipline areas of national off-farm wool RD&E capability**

AREA	% OF FTE	NUMBER OF FTE
Textile technology	56%	7
Manufacturing engineering	30%	3
Quality management	14%	2

**AWI capability in off-farm RD&E:**

- AWI has investment relationships with commercial partners internationally in product innovation and processing sourcing the bulk of its off-farm RD&E from international in-house or commercial providers
- The capability meets AWI's consumer-driven innovation strategy. It focuses on early engagement with commercial partners to give such partners a competitive marketing edge for their woollen products thus encouraging increasing commercial investment
- This international research provider capability is necessary given that less than 1% of wool is processed/ consumed in Australia

**3.3 INFRASTRUCTURE**

- 24 sites are held nationally where wool RD&E is carried out. The majority of these sites are not wool RD&E specific. Facilities, management and overheads are shared between other regional agricultural research, demonstration and extension projects involving other livestock species (predominately cattle), pasture and cropping studies and natural resource management (NRM)
- NSW DPI holds the most significant stake in wool RD&E infrastructure, holding nine of the 24 sites and with 43% of this resource allocated to wool RD&E
- CSIRO holds only two sites but has the most intense focus on wool RD&E with 75% of the resource allocated to wool RD&E

- All agencies have indicated that their infrastructure will be retained over the next five years demonstrating ongoing commitment to agricultural research by all organisations
- Detailed data and tables are found in the Appendix 8.4

**3.4 SHEEP FLOCKS**

- 37,461 sheep are held in the national flock for the purposes of wool research with a spread over all sheep growing climatic zones (low rainfall/rangelands, cold/cool temperate, mild/warm temperate and Mediterranean)
- The most significant stake in flocks for wool RD&E are held by University of New England and NSW DPI. DPI Victoria, CSIRO and University of Melbourne also hold significant, albeit lower, flock numbers
- The relative importance of these flocks is a function of their research value, rather than their size, with research value influenced by factors such as the genetic, phenotypic and pedigree information recorded (see Appendix 8.5 for details)
- The likely retention of all flocks held by University of New England, Victoria DPI, CSIRO, University of Melbourne and all except one flock in NSW demonstrates ongoing commitment to wool research by these organisations
- Detailed data and tables are found in Appendix 8.5



# 4 ALIGNMENT OF CURRENT INDUSTRY AND GOVERNMENT RD&E OUTCOMES

## 4.1 NATIONAL RESEARCH PRIORITIES (AUSTRALIAN GOVERNMENT)

The Australian Government established a set of Rural Research and Development Priorities to balance new and ongoing R&D investment needs for the primary production sector, and to ensure R&D objectives of the Australian Government are met.

The Rural R&D Priorities were developed in consultation with State and Territory governments, industry, research funders and providers. A shared approach to priority setting among the players helps focus R&D efforts on issues of major importance. The Priorities will enable issues of common concern to be explored in a coordinated and cost effective way. The R&D priorities focus R&D investment in areas of greatest need and are particularly important in guiding the Rural Research and Development Corporations and Companies and thus impact significantly on the work of research providers and other research investors in related fields. The national Rural Research and Development Priorities are:

- Productivity and Adding Value
- Supply Chain and Markets
- Natural Resource Management
- Climate Variability and Climate Change
- Biosecurity

- Supporting the Rural Research and Development Priorities

These Rural R&D Priorities complement the National Research Priorities (DAFF, 2010) which are:

- An environmentally sustainable Australia
- Promoting and maintaining good health
- Frontier technologies for building and transforming Australian industries
- Safeguarding Australia

The National Strategic Rural Research and Development Investment Plan was endorsed in June 2011 by the Commonwealth Government with the investment themes of:

- Industry development
- Sustainable production
- Transformational RD&E
- Capacity in people
- International links

It is recognised that all agencies and stakeholders face RD&E budgetary pressures and require best possible returns from their RD&E investments. It is the intention that agencies will build and retain capability in fields that are strategically important to the national wool industry, leading to the development and maintenance of a nationally coordinated network of RD&E capability.

## 4.2 STATE AGENCY PRIORITIES

State departmental strategic plans were accessed and mapped against the Rural RDC priorities at a strategy or objective level and all plans share the objectives of the Rural RDC priorities. DAFWA and SARDI/PIRSA state agency plans specifically mention sheep and wool. Detailed mapping of departmental strategic plans are found in Appendix 8.2.

The state agencies identified their future role in Wool RD&E and self selected their categorisation under the PISC definitions of “Major-Support-Link” for the National Wool RD&E Strategy (Table 4). These are:

- Major agencies - DAFWA, NSW DPI
- Support agency - DPIPWE
- Link agencies - DPI Vic, SARDI/PIRSA, DEEDI Qld, CSIRO

**Table 4. Stage agency intended role in Wool RD&E**

STATE AGENCY	INTENDED ROLE IN WOOL RD&E	NUMBER OF FTE
NSW DPI	Major	32
DAFWA	Major	23
DPIPWE	Support	5
SARDI/PIRSA SA	Link	14
DPI Vic	Link	8
DEEDI Qld	Link	8
CSIRO	Link	7
DRPI NT	Link	0

## 4.3 CSIRO PRIORITIES

CSIRO identify the following fields as important and potentially valuable to the Australian wool industry:

- Understanding the biology of wool fibre attributes, underpinned by genomic technologies
- Understanding the biology of breech strike, underpinned by sheep and insect genomic technologies
- Understanding development of hard to measure wool traits, and how they might interact with other animal traits
- Second generation wool harvesting technologies (i.e. is there an agent that can deliver epidermal growth

factor-like effects without the downsides)

- There are also some research and development fields that CSIRO regards as important, but have been captured in other National RD&E plans
- Adaptation to climate change, and mitigation of greenhouse gas emissions from ruminant livestock (This has been captured in the National Sheepmeat Production RD&E Strategy, and included in the Climate Adaptation Flagship business plan)
- Genetic improvement in feed efficiency of sheep (again in the Sheepmeat RD&E plan)

- Sustainable agricultural systems (captured as part of the Sustainable Agriculture Flagship business plan)

#### 4.4 UNIVERSITIES

The Universities involved in the wool industry through both on- and off-farm RD&E have no documented strategic priorities. Research groups at Universities are typically formed along discipline lines (genetics, nutrition, health, reproduction, etc.) across species.

As an example of the development of research priorities along discipline, rather than single animal species or

product lines, ruminant researchers at NSW DPI, UNE and CSIRO based at Armidale are forming a “Production Efficiency at Pasture Research Alliance”. This group will be focusing its significant collaborative capacity on nutrient utilisation (individual intake, body composition, energetic efficiency, methane, genotype by environment, remote sensing, modelling), the pasture-animal interface, environment, animal welfare and maternal efficiency. The research outcomes from this alliance will be relevant to the wool, sheepmeat and cattle industries.

#### 4.5 AUSTRALIAN WOOL INNOVATION

The AWI 2010-2013 strategic plan for on- and off-farm RD&E reflects a repositioned investment environment with a decline in the levy base.

See [http://images.wool.com/pub/AWI0640\\_AWI\\_Strategic\\_Plan\\_Summary-revised310810.pdf](http://images.wool.com/pub/AWI0640_AWI_Strategic_Plan_Summary-revised310810.pdf).

The AWI RD&E Strategic Plan aims to generate information and knowledge to foster the viability, productivity and sustainability of the wool industry and increase demand.

The RD&E spend of AWI is 50% of levy income (the balance is spent on marketing) according to the most recent levy payer survey (WoolPoll 2009). Of this 50%, the split between on- and off-farm RD&E is 60:40.

##### The AWI on-farm RD&E strategy targets three outcomes:

1. Foster sustainable, profitable and ethical animal care and wool production.
2. Foster sustainable, profitable and ethical land and resource management.
3. Industry resilience, confidence and growth.

##### The AWI off-farm RD&E strategy targets three outcomes:

1. Sustainable, ecological and profitable processing.
2. New knowledge and innovation to support and develop markets and uses for wool.
3. Marketplace extension and trade and consumer education.

#### 4.6 WOOL INDUSTRY OUTCOMES

##### 4.6.1 Grower priorities for on- and off-farm investment

Grower priorities for the wool strategy were compiled from a series of forums, workshops and surveys run specifically for this strategy development. The consultation process delivered over 500 individual project ideas and needs for wool sheep and sheep in general and the items important to wool were differentiated from those of interest to both wool and meat sheep growers.

Wool grower “wool specific” priorities are:

##### Wool production profitability through:

- Best practice on-farm animal management
- Reproductive efficiency and genetic gains
- Labour efficiency, particularly shearing

##### Wool supply chain management and demand growth through:

- Accurate supply chain intelligence
- Product, processing and manufacturing innovations
- Consumer confidence in woollen products
- Wool selling systems
- Post harvesting efficiencies

##### Wool industry resilience and growth through:

- Provenance and verification systems for animal welfare and eco credentials

##### Wool industry skills development through:

- Information distribution to growers
- Specific skills development
- Support for strategic thinking

The wool grower priorities and AWI on- and off-farm programs align in the areas of best practice management, genetic gain, shearing labour efficiency, accurate supply chain intelligence, product and processing innovation, customer and consumer product confidence, environmental and animal production credentials, information distribution to growers, skills development and supporting strategic thinking.

Managing wool selling risk and seeking efficiencies in the wool handling chain had mixed support during the grower consultation process. They are not specifically addressed in AWI's current plan (although they were included in earlier plans). These issues may be considered to have been adequately explored in previous investments or have no market failure, or not be of concern to the processing sector to warrant levy payer investment. Nevertheless, a broader area of market access to ensure ongoing access to key processor and emerging retailer markets is included in the AWI Strategic Plan. The recommendations from the report “New Zealand Merino supply chain business model for Australia” (Project: EC70) looked at drivers and barriers to alternate supply systems from growers’ and processors’ perspectives, therefore may guide AWI market access project investments.

The grower identified priorities of a non wool specific nature have been shared with MLA with the opportunity

for them to be assessed through the Sheepmeat RD&E Strategy's Red Meat Co-Investment Committee project evaluation framework.

The Wool grower priorities from the 2010 strategy consultation are summarised in a tabular form in the Appendix 8.1.

#### 4.6.2 Off-farm priorities

Given over 99% of wool is consumed outside of Australia and no processing is done onshore, AWI is the primary vehicle for consultation with processors, manufacturers and the retail sector.

Off-farm wool only areas of interest identified from AWI consultation processes are as follows (some are being addressed in the current AWI Strategic Plan to 2013 and others are potential investments out to 2030):

##### Measurement:

- Development of instruments and/or techniques for the objective measurement of sensory elements in wear

##### Processing innovation:

1. Low Water Processing: including dry processing, gaseous processing and solvent processing technologies.
2. Water Recycling technologies for processing.
3. Low Energy processing:
  - a. Low temperature scouring, dyeing and finishing
  - b. Better/more insulated processing equipment to prevent loss of heat
  - c. Better energy management practices
  - d. More energy efficient drying processes
4. Natural Colouration Technologies and Developments.
  - a. Naturally coloured wools from farm (with improved photostability)
  - b. Chemicals and dyes from natural sources
  - c. "Green" chemistry
5. Quicker yarn formation processes: spinning.
6. Faster/shorter processing systems.

##### Product innovation:

1. Biodegradability improvements for end of life products.
2. Fibre recycling technologies: garments to fibrous or non-fibrous product at end of life.
3. Product maintenance: self cleaning (apparel, bedding, carpets).

4. Smart textiles.
5. Thermally responsive clothing: able to be warm in cold and cool in warm weather
6. Healthy aspects:
  - a. Healthy wool
  - b. Medical textiles
  - c. Drug delivery systems
7. Moth resistant clothing/ interiors.
  - a. By genetics
  - b. By eco chemistry
8. Shrink resistant/ anti felt:
  - a. By genetics
  - b. By eco chemistry
9. Enhanced uptake of noxious vapours/ atmospheric pollutants.
10. Noise pollution options.

#### 4.6.3 Extension

Extension services have predominately been provided by the public sector, which historically invested heavily in personnel who worked with producers on a one-on-one basis or through groups. More recently, budgetary constraints faced by government extension agencies and a sharper focus on the provision of services with public (rather than private) benefits have significantly reduced their ability to engage producers on a one-on-one basis - as well as reducing their reach as staffing levels have declined.

Because of this changing environment, increased collaboration has been essential and the methods of contact have diversified. The Australian Wool Education Trust (AWET) has responded to dropping enrolments in sheep and wool sciences by licensing education modules developed from Sheep CRC1 and other sources to delivery by the UNE such that students from other

universities study those UNE units as part of their degree. AWET provides travel assistance to such students. The University of Western Australia is also forging a formal link with UNE (School of Environment and Rural Science) to ensure cooperation and collaboration in teaching and research.

Producers have also had an increased willingness to contribute financially to their own education (although capped at several hundred dollars, Best Wool/ Best Lamb Extension Network pers com), although this is often influenced by personal interests or areas that may have a greater impact on their business.

In a time of increased scrutiny and competing needs for investment dollars, it is critical that R&D is extended using the strengths of the various wool industry organisations. Such resources include established, branded information delivery mechanisms with high regional and local recognition and credibility.



The AWI Extension Networks (Leading Sheep, Queensland; Sheep Connect NSW, SA and Tasmania; BestWool/ BestLamb, Victoria; The Sheeps Back, WA and BestPrac for the pastoral zone) are examples of valuable producer networks that have formed as a result of producer needs and collaboration between RDCs, state agencies and private consultants. The networks have become valuable industry resources with many organisations wanting to tap into the large member base to disseminate or collect information.

Future extension investment will require ongoing collaboration between multiple organisations whilst being tailored to the producers needs. Use of new communications technology and other innovative processes will be critical as there is greater competition for time and resources. Programs will need to address a farming system based approach. Note: Details of current extension activities are included in the Appendix 8.8.

The elements of a long term strategy for extension leading to on-farm practice change are:

- Involvement of growers in the conceptualisation of research projects and throughout the project delivery
- Integration of extension outcomes at the start of research and development projects
- Currency and consistency of knowledge on R&D within the private extension sector with associated development of a value proposition for their involvement

- Currency and consistency of knowledge on R&D within the natural resource management agency advisory staff
- Collaboration with government extension providers to ensure a source of independent advice
- Enhancement of rural youth skills while at school for life long learning, risk assessment and systems management
- Use of highly recognisable and credible branded delivery mechanisms and provision of IP to non wool industry delivery mechanisms (especially the natural resource management space)
- Local tailoring of extension delivery
- Demonstration at the local level of the impact of a change in practice
- Facilitate the grower to grower knowledge and skills exchange through groups, networks and forums
- Career development for post graduates through inclusion as researchers in additional R&D projects
- Collaborative projects between state agencies and universities to ensure curricula are updated
- Provision of a diversity of channels for awareness and reinforcement through print, audio and electronic media
- Maintenance of Wool Strategy participants' eligible schemes on the Australian Competitive Grants

Register to assist higher education providers in gaining funding under the Australian Government's Research Block Grants

Educating the trade falls within the role of AWI and is required to support the product marketing for innovations in fashion apparel, performance apparel and environmental and health benefits. This requires an improved understanding of the competitive advantages of wool, better equipped sales staff at retail level and more confidence and ability to use wool in products. The target market are retailers and brand owners through trade fairs, retail workshops supported by product marketing materials and colour trend information.

#### 4.6.4 Alignment of wool RD&E outcomes

The alignment of priorities for all agencies and organisations involved in delivering wool RD&E is strong (see Appendix 8.2). The similarities between priorities and the tight scope of priorities across organisations, whose planning timeframes extend from 2009 to 2014, have facilitated the development of common wording to describe these areas as programs within a Program Framework approach for the National Wool RD&E Strategy during its implementation phase.

The major area where alignment does not occur is in the area of biosecurity, product integrity and residue management. These are priority areas identified by the Working Group, government agencies and AWI. However,

this was not voiced as a priority area by wool growers during the consultation process for this strategy. This may have been because biosecurity is taken as sufficiently covered in general sheep research and can be supported by supporting investments in the National Sheepmeat Production RD&E Strategy (the implementation stage of the Sheepmeat Production Strategy is through the RedMeat Co-investment Committee, of which AWI is a guest member). Product integrity and residue management may be considered by growers to be sufficiently covered by the National Wool Declaration, direct supply chain arrangements and existing environmental management systems.

During the implementation phase of the National Wool RD&E Strategy, there exists an opportunity to cross reference with the National Animal Biosecurity RD&E Strategy and the National RD&E Framework Extension Project as these are developed. Similarly, as the National Climate Change Research Strategy for Primary Industries is developed it will be able to be referenced to the activities under the Wool Strategy as the majority of investments in the climate change area will be cross sectoral until sufficient knowledge capability exists for wool industry specialisation (for example in methodologies for wool carbon accounts).

The National cross sector strategies, such as the National Animal Welfare RD&E Strategy, will facilitate collaborative investment beyond any wool specific investment from this Wool Strategy.

# 5 STRATEGIC DIRECTION FOR NATIONAL WOOL RD&E

## 5.1 VISION

A profitable and sustainable Australian wool industry producing the world's best natural fibre.

Needed to achieve this vision is: A highly efficient and effective wool RD&E sector,

undertaking collaborative investment and capability planning, to develop and deliver technology and systems that improve wool production, supply chain management, demand growth and industry resilience.

## 5.2 ELEMENTS OF THE STRATEGY

To achieve a national RD&E strategy for the wool industry, both a program framework for investment and a change strategy to guide implementation has been agreed.

### This will:

- Provide shared strategic directions and priorities for wool RD&E in Australia for 2011-2030
- Align Australian research capability to cover the present and future strategic needs of the wool industry
- Allow coordination of Australian

publicly funded R&D capability and specialization by individual agencies

- Improve returns on investment in publically funded RD&E
- Facilitate effective and efficient use of wool industry RD&E resources and infrastructure
- Integrate development and extension with research
- Share research outputs nationally to enable development to occur regionally and adoption locally, where relevant

### The guiding principles for the Program Framework and Change Strategy are:

1. Existing structures and processes for engagement between wool investors and RD&E providers will be used where possible
2. The autonomous governance arrangements of wool industry RD&E participants will not be superseded by any overarching collaborative governance arrangement
3. Agencies will fund their participation in consultation and collaboration processes
4. Existing alignment of the investment priorities of wool industry RD&E participants is such that all will be incorporated into the initial program framework

5. All participants have the ability to review the program framework to respond promptly to threats and opportunities
6. Public, industry and end user (user pays) funding for projects will be sought according to the flow of project benefits to the public, industry and individuals
7. Public good activities remain a primary responsibility of state agencies
8. Agencies will identify themselves as major, support and link participants in the implementation of the program framework
9. Participants in the program framework value and contribute to monitoring and reporting under the National Wool RD&E Strategy
10. The Wool RD&E Program Framework will not duplicate cross sector strategy investments.

## 5.3 THE NATIONAL WOOL RD&E PROGRAM FRAMEWORK 2011-2030

Programs are the identified priority areas for the wool industry over the period 2011-2030, and have been identified as the major investment areas for wool industry RD&E. The programs for investment in the wool industry are:

1. Wool production
2. Wool supply chain management and demand growth
3. Wool industry resilience and growth

Subprograms are the components of the programs and contain specific areas for investment for wool industry RD&E. The subprograms are detailed below (and summarised in Table 5 on page 44):

### Program 1. Wool production

#### Subprogram 1.1 Attaining best practice on-farm management for wool production through:

- Increasing labour efficiency—including sheep handling infrastructure, matching genotype to environment,

optimizing the mix and timing of management practices and reducing labour demands of wool enterprises

- Improving Merino management practices to increase proportion of the clip meeting market requirements for physical fibre quality
- Improving parasite management practices for increasing health and productivity—including improving immunity, reducing chemical use and improving integration of parasite control strategies
- Improving management systems to increase Merino reproductive efficiency—including mating ewe lambs, increasing conception rates, increasing lambing and weaning rates, and improving weaner survival

#### Subprogram 1.2 Accelerating genetic gains of Merino sheep through:

- Genetic tools and selection systems to improve reproductive efficiency in Merino flocks
- Genetic tools and selection systems to enhance parasite resistance

- Genetic tools and selection systems to improve commercially valuable fibre quality and fibre growth traits
- Genetic tools with genomic enhancements
- Realizing the benefits of genetic tools: through genetics extension and genetic benchmarking projects

**Subprogram 1.3 Enhancing welfare of wool producing sheep through:**

- Reducing, replacing or refining the use of invasive husbandry procedures—including developing best practice techniques and safe, effective pain management strategies
- Reducing on-farm sheep mortality- including reducing the impact of wild dog predation

**Subprogram 1.4 Improving wool harvesting and clip quality through:**

- Furthering alternate wool harvesting technologies—including an alternative to comb and cutter shearing applicable for all sheep
- Improving the efficiency of wool harvesting systems

**Program 2. Wool supply chain management and demand growth**

**Subprogram 2.1 Innovating product, processing and manufacturing through:**

- Delivering novel products to new markets in apparel, interior textiles and floor coverings products focusing on fashion, health and fire safety
- Improving cost efficiency by optimizing processing and manufacturing technology and resource use

**Subprogram 2.2 Improving supply chain logistics through:**

- Reducing post harvesting costs—including scoping technological and operational opportunities in wool sampling and testing, classing and bale identification
- Improving the efficiency of wool selling systems—including assessing the feasibility of alternate wool selling systems

**Subprogram 2.3 Strengthening consumer confidence in woollen products through:**

- Objectively measuring for sensory elements in wear- developing instruments and/ or techniques
- Defining consumer requirements and monitoring understanding and satisfaction - including the role and benefits of wool
- Meeting consumer requirements for the characteristics of woollen products—including developing fabric standards and labelling
- Improving product quality to support market requirements for wool quality, aesthetics and ecological sustainability

**Program 3. Wool industry resilience and growth**

**Subprogram 3.1 Protecting market access through:**

- Effective biosecurity systems
- Enhancing product integrity

**Subprogram 3.2 Enhancing wool enterprise resilience through:**

- Adaptation of wool production systems to climate variability (seasonal) and climate change (decadal)
- Participation of wool enterprises in carbon and environmental markets with positive business outcomes—including RD&E into on- and off-farm carbon sequestration and greenhouse gas reduction
- Skills and knowledge building within a systems approach to wool production- including improving industry skills in shearing, wool handling and wool classing to improve labour efficiency and fibre quality during harvesting and encouraging new entrants to the industry; improving supply chain intelligence supporting decision making throughout the supply chain to manage risk and identify opportunities in the value chain; demonstrating RD&E to wool growers and the supply chain including wool growing demonstration sites; supporting education and extension on and off-farm





**Subprogram 3.3 Building environmentally sustainable wool enterprises through:**

- Supporting management systems preserving the natural resource base
- Supporting optimal pasture productivity and grazing management

**Subprogram 3.4 Building wool industry strategic thinking through:**

- Strengthening value propositions for wool growing—including comparing wool with other enterprises as stand alone or mixed with meat or cropping
- Supporting strategic responses to industry threats—including analysis of threats (historical and in other industries) and plan a program framework in response

- Refining wool forecasting systems

The Programs address strengths, opportunities, weaknesses and threats to the Australian wool industry, as identified below:

**Strengths:** The reinvestment in international marketing for Australian wool as a premium product by AWI supports the supply chain, aims for high but not volatile prices and delivers quality improvement and product innovation. Quality refers to naturalness, biodegradability, renewability, low carbon footprint, comfort and luxury.

**Opportunities:** There is room for gains in sheep management through innovative use of inputs delivering labour efficiencies and strategic management using a farming systems approach, lower costs and increasing kilograms of

**Table 5. National Wool RD&E Program Framework and alignment with National Sheepmeat Production RD&E Strategy**

	Program 1: Wool production	Program 2: Wool supply chain management and demand growth	Program 3: Wool industry resilience and growth	National Sheepmeat Production RD&E Strategy - common Strategic Imperatives
<b>Subprogram</b>	1.1 Attaining best practice on-farm management for wool production through: Increasing labour efficiency Improving Merino management practices to increase the proportion of the clip that meets market requirements for physical fibre quality Improving parasite management practices for increased health and productivity Improving management systems to increase Merino reproductive efficiency	2.1 Innovating product, processing and manufacturing through: Delivering new products to new markets Improving cost efficiency	3.1 Protecting market access through: Effective biosecurity systems Enhancing product integrity	Increasing cost efficiency and productivity (including adaptability and risk management) Developing new and existing markets Enhancing food safety, product integrity and biosecurity

	Program 1: Wool production	Program 2: Wool supply chain management and demand growth	Program 3: Wool industry resilience and growth	National Sheepmeat Production RD&E Strategy - common Strategic Imperatives
<b>Subprogram</b>	1.2 Accelerating genetic gains of Merino sheep through: Genetic tools and selection systems improving reproductive efficiency in Merino flocks Genetic tools and selection systems improving parasite resistance Genetic tools and selection systems improving commercially valuable fibre quality and fibre growth traits Genetic tools with genomics enhancements Realizing the benefits of genetic tools	2.2 Improving supply chain logistics through: Reducing post harvesting costs Improving the efficiency of the wool selling systems	3.2 Enhancing wool enterprise resilience through: Adaptation of wool production systems to climate variability (seasonal) and climate change (decadal) Participation of wool enterprises in carbon and environmental markets with positive business outcomes Skills and knowledge building within a systems approach to wool production	Enhancing integration and value adding in supply chains (including cost efficiency) Increasing natural resource use efficiency and reducing environmental impacts
<b>Subprogram</b>	1.3 Enhancing welfare of wool producing sheep through: Reducing, replacing or refining the use of invasive husbandry procedures Reducing on-farm sheep mortality	2.3 Strengthening consumer confidence in woollen products through: Objectively measuring for sensory elements Defining consumer requirements and monitoring understanding and satisfaction Meeting consumer requirements for the characteristics of woollen products Improving product quality	3.3 Building environmentally sustainable wool enterprises through: Supporting management systems that preserve the natural resource base Supporting optimal pasture productivity and grazing management	Aligning animal welfare practices with consumer and community expectations
<b>Subprogram</b>	1.4 Improving wool harvesting and clip quality through: Furthering alternate wool harvesting technologies Improving the efficiency of the wool harvesting systems		3.4 Building wool industry strategic thinking through: Strengthening value propositions for wool growing Strategic responses to industry threats Wool forecasting systems	

wool per enterprise and lower carbon footprints per kilogram of wool. Product innovation in woven apparel and performance wear will drive consumption and open up new markets. The “stories” that retailers and brands request about the production and processing of wool will need to be evidenced by research and an extension effort.

**Weaknesses:** The vulnerability of wool supply to climate and more profitable competing enterprises (commodity value or production costs) needs to be addressed. Consumer perceptions, dominated by negative images or outdated products need to be reformed. The long supply chain cannot be revolutionised but small points of alteration need to be identified.

**Threats:** Productivity gains in wool lag behind the major alternative enterprise choices and the complexity of advanced breeding technologies is stifling

adoption and potential genetic gain. The lack of farm labour has permitted the resurgence of large predator impacts in the pastoral zone becoming a tipping point for the presence of sheep and the demands of shearing as an occupation frustrates clip management and planning efforts. Off shore processing puts wool at risk of trade barriers and cheap synthetics have a strong price advantage over the lower quality wools.

### 5.4 NATIONAL SHEEPMEAT PRODUCTION RD&E STRATEGY

The National Sheepmeat Production RD&E Strategy of January 2010 is complementary to the National Wool RD&E Strategy, with its vision being “A profitable, competitive and sustainable sheepmeat production sector that meets or exceeds supply chain, consumer and community expectations”.

The National Sheepmeat Production RD&E Strategy has identified seven Strategic Imperatives, four of which provide opportunities for co-investment by wool industry RD&E participants:

- Enhancing food safety, product integrity and biosecurity
- Increasing natural resource use efficiency and reducing environmental impacts
- Increasing cost efficiency and productivity (including adaptability and risk management)
- Aligning animal welfare practices with consumer and community expectations.

**The remaining sheepmeat production Strategic Imperatives are:**

- Improving sheepmeat eating and nutritional quality

- Developing new and existing sheepmeat markets
- Enhancing integration and value adding in supply chains (including cost efficiency)

While these three Strategic Imperatives are not mutually exclusive of wool programs, they are focused on sheepmeat production with little cross over into the wool sector.

The Wool Strategy addresses RD&E areas identified as wool specific. RD&E areas identified which relate to sheep and farming systems but not specific to wool production will be addressed in collaboration with the relative sector strategy and the Sheep meat RDC (MLA). Examples of non wool specific areas to be addressed in this way include sheep farming systems, pastures, grazing management, and animal welfare.



## 6 CHANGE STRATEGY FOR WOOL RD&E

### 6.1 NATIONAL COLLABORATION

The intent is to build on the regional and local mandates of the state agricultural departments and to build a truly national RD&E network. The PISC National Framework for RD&E is built on the key tenet that basic and strategic research can be conducted nationally, developed regionally and extended locally.

There are efficiencies currently being achieved through collaborative national wool RD&E programs, both inter-agency and cross sectoral. These are facilitated by either the relevant CRCs' Participant's Agreement, DAFF collaborative programs and contracts or by contracted investment partnerships between AWI and MLA whereby responsibility for the governance is taken by one RDC through management agreements.

Expertise in wool based RD&E is held by the state departments, the CSIRO, Universities and AWI. There is agreement within the Working Group that conducting wool R&D and associated extension must be a coordinated effort to maximise impact, however it was acknowledged that successfully implementing such an approach within autonomous governance environments can present challenges.

The PISC National Framework for RD&E aspires to basic and strategic research being planned nationally and conducted collaboratively. This is difficult to apply to wool's off-farm research (product and processing R&D) due to off shore dominance of processing, manufacturing

and retailing of wool, as well as market forces locating the majority of off-farm researchers internationally. In addition, there is an increasing majority of international private sector, commercial in-confidence product development research driven by the retail sector's need for fashion innovation, precluding reporting to, and investment by public sector.

### 6.2 AREAS FOR IMPROVEMENT

RD&E delivery faces ongoing cost efficiency pressures despite the increase in wool price in 2010/2011. A national framework for wool RD&E will increase efficiency by addressing the following opportunities for improvement:

- There is no formalised calendar for dialogue between the agencies represented on the Working Group to discuss project ideas, resource availability, strategic industry outcomes or collaborative opportunities across all priority areas
- There is no wool industry agreed program framework under which all wool RD&E participants objectives, measures of success and activities (current and planned) have been mapped
- There is no sharing of information about the investment in RD&E of each wool industry RD&E participant
- There is no inventory shared between wool industry RD&E participants regarding collaborative projects beyond that reported to the CRRDC

Without any of the above there is no baseline from which improvements in efficiency of RD&E delivery can be accurately assessed.

The identified wool sector priorities that are not wool specific will be planned in partnership with the Redmeat Co-investment Committee and investment collaborations will be determined according to the benefits to each sector. All State government departments are members of the Redmeat Co-investment Committee and AWI is a guest member. This membership reduces administrative duplication of common interests and allows for collaborative planning.

### 6.3 CHANGE PLAN

Maintaining the National Wool RD&E Strategy will be the responsibility of the national Wool RD&E Working Group which will be expanded to include MLA. This group will conduct a comprehensive review of the Strategy and an audit of RD&E capability and infrastructure every three years.

The vehicle for change will be the implementation of the National Wool RD&E Program Framework for planning and collaboration. Facilitation of planning with RD&E deliverers (inclusive of private research and development companies) can follow an existing model of consultation with growers by AWI. Thus an annual forum of the wool industry RD&E deliverers is proposed to be coordinated by both AWI and those agencies with an identified major role in wool RD&E (DAFWA and NSW DPI). The output of this forum will be the identification and prioritisation of projects under the Program Framework and agreed measures of success.

It is anticipated that the forum will identify members of Technical Groups assigned to different subprograms of the Program Framework to collaboratively

develop project proposals. The Technical Groups will ensure high quality proposals. The Working Group will be used as a reference group by the Technical Groups and AWI will provide access to its Producer Advisory Panels (governance structures for its AWI Extension Networks of BestPrac, Bestwool/Bestlamb, Sheep Connect Tas/NSW/SA, Leading Sheep and The Sheeps Back). AWI will also provide access to its Expert Panels of 2011 – 13.

Given the importance of reproductive efficiency to both the Wool and Sheepmeat RD&E plans, and the similarity between these plans in this area, population of the program framework for both plans will occur collaboratively. This will eliminate duplication and ensure RD&E outcomes are relevant to both the Wool and Sheepmeat sectors.

This facilitated change approach still allows individual wool industry RD&E participants to respond promptly and independently to threats or opportunities outside of the national wool Program Framework without requiring the agreement of other participants. However it would be expected that the activities would be reported and the outcomes shared.

This approach places the strategic focus on wool industry specific issues, with emphasis on greater linkage to, and collaboration with, other industries plans when addressing priorities common across industries. This approach also encourages delegation of project management and evaluation to a single participant for collaborative projects, as well as agreed templates for contracts between collaborators and for commercial partnerships. It uses an agreed calendar of activities and framework for reporting to stakeholders.



The existing alignment of the priorities of wool industry RD&E participants simplifies the future population of the Program Framework with projects and a future review of programs without implying significant investment disruption for those participants. A participant's investment interest and skill set can be matched to priorities within the Program Framework, according to their capacity as a Major-Support-Link agency.

Proposed positioning of the "Major" agencies, in regards to areas of future investment, technical strengths, infrastructure and relationships that will be pursued over the next five years, are detailed in section 7.

A mechanism is needed to share information between RD&E participants to ensure equitable opportunities to synthesize projects under the program framework.

**The proposed change plan is as follows:**

**A.** The establishment of a National Program Framework for Wool Industry RD&E, populated with projects, covering a minimum of five year investment horizon, to achieve program outcomes and enabling collaborative investment and forward capability planning:

1. Initial one day forum in November 2011 between wool industry RD&E participants (including the private investment sector and MLA) to synthesise project concepts and measures of success compiled from the current strategies of all participants.
2. Sharing of investment planning and strategy setting calendars to facilitate negotiations for collaborative investment for 2012.
3. Prioritization of projects and identification of opportunities for collaboration under the Major-Support-Link agency categorizations.
4. Collaborative development of project proposals to be pursued outside the forum through Technical Groups identified at the forum.
  - Technical Groups utilise the Working Group as a reference group on proposal development, cross reference with the Red Meat Co- investment Committee and where appropriate provide to or consider advice from AWI Expert Panels and AWI Extension Network Producer Advisory Panels
  - Collaborative investment to be pursued outside the forum facilitated by Working Group members

**B.** Maintenance of the National Program Framework for Wool Industry RD&E through quarterly teleconferencing of the National Wool RD&E Working Group to:

1. Review the relevance of programs and projects to the vision statement and sector environment.
2. Review the categorisation of Major-Support-Link and the association of agencies to projects and programs.

3. Share information and ideas.
4. Share RD&E outputs, plans and priorities between participants and between on- and off-farm RD&E providers.

**C.** Monitoring, evaluation and reporting to stakeholders on program outcomes:

1. Annual reporting of collaborative investments undertaken, including those resulting from the Redmeat Co-investment Committee process.
2. Annual reporting of R&D contracts, identifying extension strategies and actions.
3. Three yearly review of National Wool RD&E Strategy and Program Framework by the National Wool RD&E Working Group, in consultation with wool industry stakeholders.
4. Three yearly assessment and reporting of RD&E capability and infrastructure, matched to the Program Framework.
5. Sharing between RD&E participants of assumptions for and findings from economic evaluations of projects.

**D.** The adoption of project planning, management and investment principles to ensure relevance, efficacy and adoption of RD&E outputs:

1. Evidence of end user input into and support for the investment throughout the project delivery.
2. Extension and relevant adoption science and expertise incorporated from the initial phase of R&D.
  - Extension strategies and activities included in contracts for R&D
  - Collaboration in R&D with partners with extension expertise (public or private)
  - Collaboration with successful branded extension vehicles
3. Contract management.
  - Multiparty collaborative contracts with delegated project management
  - Commercial investors sought where RD&E projects are assessed to have outputs with commercial potential
  - Apportioning of intellectual property rights to those within multiparty contracts
  - Use of agreed contract templates

Details of the Strategy Change Plan and the risks inherent in the Change Plan can be found in the Appendices 8.7 & 8.8.

### 6.4 TIMELINES AND CRITICAL SUCCESS FACTORS

STRATEGY	ACTION	TIME	KPI
National Wool RD&E Strategy document	Seek signoff from Working Group participants and grower organisations	July 20 2011	Agreement by all participants to the Working Group and by grower representative bodies Agreed national strategy Consultation Draft for submission to PISC
	PISC R&D sub committee submission	July 27 2011	Strategy submitted
	PISC R&D sub committee presentation	August 3 2011	Strategy presented to R&D subcommittee
	PISC R&D sub committee submission: final document		Final document submitted
	Strategy presented to PISC meeting	September 21 2011	PISC seeks jurisdictional signoff of final draft
	Submission to PISC: final version of strategy	October 5 2011 (TBC)	PISC endorsement received
	Strategy presented to PIMC by Chair of R&D subcommittee	November 18 2011	PIMC endorsement received
Inaugural national wool RD&E delivery sector forum	AWI incorporate a November forum into its operational plan consultation cycle	September 2011	Operational plan changed for 2012/2013
	AWI and DAFWA to call a meeting of the National Wool RD&E Working Group	September 2011	Tasks allocated for forum organisation

STRATEGY	ACTION	TIME	KPI
	National Wool RD&E Forum held	November 2011	Report to stakeholders on forum outcomes—agreed program framework wording, allocation of major support and link agencies to priorities under programs, key agency contacts for priorities, data required for baseline, elements of the next forum
National Wool RD&E Program Framework	Seek industry wide agreement on any updates to the framework	March 2012	Operational plans across the sector refer to the wool program framework
Annual forum	National Wool RD&E Working Group meeting	As above	As above
	National Wool RD&E Forum	As above	
3rd year report	National Wool RD&E Reporting Group formed	September 2014	Description of baseline at 2011 Description of progress for each strategy (elements gathered at annual forums and by email) Findings communicated in a written report to the Commonwealth and other stakeholders
	Cycle repeats from November 2011		

Funding the implementation of the Strategy will be the responsibility of all wool industry R,D&E participants. AWI has allocated human resources to the delivery of the forum and involvement of

its Producer Advisory Panels and Expert Advisory Panels. Participants in the forum event and in Technical Groups will self fund their involvement as will members of the ongoing Working Group.



## 7 BUILDING ON EXISTING NATIONAL CAPABILITIES

**Sheep:** RD&E in wool sheep is fortunate to have the support of human resource and infrastructure capacity from the sheepmeats industry for activities on sheep health, welfare, productivity, farming systems, the environment, nutrition, genetics and extension. Commonly investment is collaborative with MLA rather than competitive for those resources, due to the recognition that the Merino ewe is the most common maternal breed for prime lamb production and as such, investment in the Merino ewe is valued. The capacity apportioned to wool is estimated and thus monitoring of changes in capacity will be with reference to data collected under the National Sheepmeat Production RD&E Strategy.

There is no evidence from current investors that wool specific, on-farm projects cannot proceed due to a lack of human or infrastructure resources.

**Fibre:** The wool fibre RD&E capability in Australia has shrunk with AWI taking the bulk of its research into product development and processing efficiency internationally with commercial partners under confidential arrangements, harnessing the expertise located where the processing, manufacturing and fashion industries now dominate. The Australian based research is restricted to some wool fibre RD&E at the Universities or through AWI research partnerships through the Sheep CRC. However, these Sheep CRC projects are only for a finite period until 2014.

The trend towards off shore capabilities will continue as funds under AWI

administration dominate wool fibre and fabric research, directed by AWI's corporate strategy of working with commercial partners close to the international consumer end of the supply chain. The leveraging of grower levy money for RD&E in product development and processing efficiency from commercial entities operating off shore is an important source of efficiency in the delivery of off-farm RD&E.

This approach is concerning to the remaining fibre researchers in Australia who have witnessed significant restructure and loss of funds. This strategy has to acknowledge and be sensitive to this concern, by carefully considering potential creative and niche uses for the remaining on shore expertise, and requires new relationships and a reinvention of the role Australian fibre researchers play for the Australian wool industry.

**Capability Gaps:** Matching the Program Framework against the human resource capabilities shows it is well supported by Australian or international capability in productivity and profitability on-farm, product development off-farm, value chain targets on and off-farm, and extension on and off-farm. The 132 on-farm FTEs is considered adequate at a national R,D & E investment level estimated at \$28 million based on the fact that there are no contracting or milestone delivery delays negatively impacting on current research. The expected population of the Program Framework with new projects over a minimum 5 year time horizon as a result of the Annual Forum, Working Group

and Technical Groups will send market signals to R, D & E providers regarding future capability requirements and areas of specialisation. Given a 3 year WoolPoll cycle through which woolgrowers determine the R, D & E investment budget the market signals beyond a 3 year time horizon cannot be improved.

Capability is well covered in the on-farm areas of education and extension, genetics and parasitology.

Capability for the natural resource management area is less available given the inclusion of climate variability in this theme and the small number of experts. However, existing investments at AWI in this area has shown a focus on collaboration between RDCs to tap this small pool.

The Sheep CRC, under the current Participants Agreement, winds up at the end of the financial year 2013/14. From their Operational Plan for FY10/11 the FTEs for wool are estimated at 21.6 with 16.6 of these in reproduction efficiency, parasite management, genetics, methane emissions and extension. These are priority areas under the Wool Strategy and CCRSPI and are likely to be ongoing investments under the Program Framework for wool RD&E. The 5 FTEs in fibre research will have to compete with off shore providers or find alternative opportunities under the Program Framework. Their involvement in the Annual Forum under this Strategy will be required to ensure wool quality is maintained or improved as a result of projects identified in the Wool Production (Program 3).

### 7.1 "MAJOR" AGENCIES

DAFWA and NSW DPI have nominated to be major agencies in future Wool RD&E.

Identified RD&E themes which DAFWA will concentrate on include genetics,

genomics and management with an emphasis on breeding for resistance to parasites; reproduction and maternal efficiency; feedbase management; and strategic modelling of the world wool industry and supply chain. DAFWA will also play a support role to Murdoch University in the area of meat science. The above themes are closely aligned to the following sections of the National Wool RD&E Program Framework:

**1.1** Best practice on farm management for wool production

**1.2** Accelerate genetic gains of Merino sheep

**1.3** Welfare of wool producing sheep

**2.2** Improved supply chain logistics

The capital required to lead these areas includes maintenance and development of sheep facilities at the current Research Support Units at Katanning, Mt Barker and Medina, including glasshouses for feedbase management R&D; maintenance of the Sheep CRC Information Nucleus flock and the Breech Strike flock for genetics and reproduction themes; continued development of human resource capability to meet current and future needs of the Australian wool industry for RD&E.

Technical strengths currently existing within DAFWA include relationships with Murdoch University and the University of Western Australia; good relationships with AWI and MLA; adoption and evaluation including the development of training packages in consultation with industry training organisations and private consultants; scientific skills in parasite genomics and genetics, supply chain analysis and modelling, meat science, reproduction, sheep production and pastures, and co-supervision of postgraduate students.



Technical strengths required for future Wool RD&E include an increase in post graduate training, especially in the areas of physiology of reproduction, nutrition (currently a gap nation-wide), sheep meat production and supply chains.

DAFWA partnerships for Wool RD&E are currently with AWI, MLA, Landmark, national universities (primarily Murdoch, University of Western Australia, University of New England), CSIRO and international universities (Massey University New Zealand, Mordun University Scotland, Wageningen University Netherlands).

NSW DPIs research expertise in precision sheep management, applied genetics, reproduction, lamb and weaner survival, climate variability and greenhouse gas abatement align with the 3 of the 4 Wool production sub programs. Extension specialists in livestock and pasture systems, soil carbon scientists as well as biosecurity

networks through the state-wide Livestock Health and Pest Authority (LHPA) will align closely with the majority of the Program 3 subprograms.

Research stations located in the major production zones of NSW as well as a network of regionally based Sheep and Wool extension staff will ensure the development of local solutions from national research programs. Tocal College, with its two campuses (i.e. Murrumbidgee Rural Studies Centre in Yanco and CB Alexander Campus in Paterson) is a national leader in distance education for landholders and provides a range of courses for school leavers to work on and manage farms.

Collaborative research with LHPAs across the state and joint institutes with Universities (i.e. University of New England and Charles Sturt University) are among a group of effective partnerships extending the breadth of NSW DPI research and extension programs.

## 8 APPENDICES

### 8.1 STAKEHOLDER CONSULTATION

The wool grower consultation process commenced with a pilot event in Wagin, WA at Woolorama on 5 and 6 March 2010. Two afternoon open forums were held at the show, facilitated by AWI and overseen by DAFWA. The event captured 27 attendees. Invitations, background and pre-reading material were posted to levy paying share holders within 200 km of Wagin and announcements were made at the show. From the enthusiasm of the attendees in voicing the needs of the wool industry additional workshops were planned.

With the assistance of the National RD&E Working Group State

Departmental staff, State Farming Organisation staff and members and AWI Extension Network coordinators, workshops were planned for WA, NSW, SA, Vic and Tas. Invitations and background material were posted to levy paying share holders within 100-200 km of the event location. The events were posted on the AWI wool.com calendar website and media releases made. Phone calls were made using the invitation list if grower registrations were less than 10. Workshops in Bendigo and Clare were cancelled due to less than 10 registrations. Negotiations with stakeholders in Queensland revealed that funds would have to be provided for travel for participants to ensure attendance and thus an alternative consultation mechanism was sought.

Hamilton, Vic, 4 August 2010	13 growers
Merredin, WA, 10 August 2010	17 growers
Katanning, WA, 11 August 2010	14 growers
Longford, Tas, 24 August 2010	14 growers
Young, NSW, 6 September 2010	12 growers
Armidale, NSW, 9 September 2010	11 growers



The facilitation plan was modified during the first workshop at the request of growers and a card storming session was conducted for each of theme of productivity, product integrity, quality assurance, natural resource management and climate and education and extension. All project ideas for each theme were recorded and most were allocated a priority level (low, medium or high) and a time frame for delivery (short, medium or long). Facilitation was delivered by AWI and DAFWA staff. Each workshop write-up was emailed or posted to each grower attendee requesting edits. The final version of each workshop finding was posted on <http://www.wool.com/National-Research-Development-Extension-Strategy.htm> which included an email

feedback link. The workshop findings were finally collated by DAFWA and AWI and split into wool only issues or general sheep issues and presented as two separate documents. There were approximately 200 project ideas in 50 themes for the wool only findings. As Queensland and South Australian growers were unable to attend the planned workshops and the window of opportunity for attendance was closing due to the season, quotes were sought from the AWI Extension Networks, Leading Sheep and Sheep Connect and three commercial rural survey companies. Leading Sheep and Sheep Connect SA were contracted to survey membership for relevant issues and project ideas, (respondents numbering 15 and 16, respectively).

**Table 6. Wool grower wool only priorities from 2010 strategy consultation**

OBJECTIVE	THEME	PRIORITY AREA	AWI PRIORITY AREA
Wool production profitability	Best practice on-farm animal management	Improved parasite management (lice, flies, worms)	Reduced impact of lice, flies and worms
		Immunity enhancement	
		Sheep handling infrastructure evaluation	
Reproductive efficiency and genetic gains		Management for staple strength	Productivity, reproductive and labour efficiency Genetics and genomics
		Reproductive efficiency (includes survival)	
		Parasite resistance	
		Economic evaluation of gain	
Labour efficiency, particularly shearing		Demonstration of gain	Shearing industry development
		Alternate wool harvesting	
		Portable shearing	
Wool supply chain management and demand growth	Accurate supply chain intelligence	Identify barriers to commercial ownership of problem solving and uptake of solutions	Wool production forecasting and market feedback Marketplace extension of fibre knowledge and textile innovation Retail workshops Market extension materials Performance apparel and safety attributes Health and environmental attributes and benefits of wool fibre and products
		Through chain dialogue—common language and understanding (inferior blending and lot sizes)	
		Fibre/price intelligence	
		Wool production forecasting	
		Point of retail sale education	
		Promote to processors cost savings and quality improvement	



OBJECTIVE	THEME	PRIORITY AREA	AWI PRIORITY AREA
	Product, processing and manufacturing innovations	Work with commercial processing, manufacturing and retail partners to identify and commercialise innovation	Colour trends
			Trade fairs
		Innovation targeted at new markets, new products, cost efficient processing and improved quality	Fibre innovation and textile development
			Interior textiles and floor coverings
			Sustainable and ecological processing—chemicals, dyes, water and energy
	Product confidence in woollen products	Fabric standards and labelling to meet customer and consumer needs	Off-farm carbon footprint, garment care, decomposition and recycling
			Increasing global processing capacity
	Wool selling systems	Alternate wool selling systems analysis	Quality assurance
	Post harvesting efficiencies	Economic evaluation of current options	
Wool industry resilience and growth	Provenance and verification systems for animal welfare and eco credentials	Value proposition discussed within the supply chain  Evidence based marketing claims	Robust welfare standards
			Wool clip quality assurance
			Optimal land and resource management
			Adaptability to climate change
			Reducing pesticide use
			Carbon credentials

OBJECTIVE	THEME	PRIORITY AREA	AWI PRIORITY AREA	
Wool industry skills development	Information distribution to growers	Production and profitability		
		Promotion of value proposition of wool growing	AWI Extension networks	
		Use of electronic media—computer based decision support tools, pod casts, information hubs, i-pad apps, email snippets	Leadership and mentoring	
		Use of demonstration sites	Scholarships, training and coaching	
		Use of animal health groups	Young grower programs	
	Specific skills development	Use of grower networks	Use of benchmarking	Broad access communication
			Promotion of and training for high quality shearing, wool handling and wool classing	Schools
			Use of benchmarking	
			Opportunities for youth—Vocational training, scholarships	
			Economic evaluation on RDE investments using the value of industry segments	
Support for strategic thinking	Analyse and learn from the management of industry threats	Analyse future labour requirements and availability		
		Frame investments within an industry landscape of nurtured relationships, commercialisation of innovation, supply chain dialogue and practice change		



## 8.2 NATIONAL WOOL RD&E STRATEGY PRIORITY ALIGNMENT

GROWER PRIORITIES	WORKING GROUP IDENTIFIED INDUSTRY PRIORITIES	AWI PRIORITIES	RURAL RDC PRIORITIES	DAFWA 2009-2012 STRATEGIC PLAN	NSW DPI 2010-2013 STRATEGIC PLAN	DPIPWE TAS*	SA SHEEP INDUSTRY 2003-2013 STRATEGIC PLAN	DPI VIC 2008-2012	DEEDI QLD 2010-2014
Increasing farm profitability through best practice animal management, genetic gain and shearing labour efficiency	Cost efficient and productive wool enterprises that help manage on-farm risk through development and combination of new technology and management capability to increase the profitability of wool production against a background of climatic and economic variability; address key production threats, risks and opportunities for efficient sheep management	Productivity, reproductive and labour efficiency, reduced impact of lice, flies and worms, Genetics and genomics, Shearing industry development	Improve the productivity and profitability of existing industries and support the development of viable and new industries	Improve long term profitability of the agriculture and food sectors	Increase knowledge and skills and innovation driven productivity and competitiveness in business and industry	Improving the national and international competitiveness of the primary industries sector	Support the development of production systems that will provide the sheep industry with the greatest assurance of accessing a profitable and secure mix of markets and products to optimise value of the states sheep meat and wool production	Boosting productivity through technology and changes in farming practices	Increase opportunity for business trade and export to diversify our economy, increase productivity and grow regional economies
Sharing in the value chain at low risk through accurate supply chain intelligence, product and processing innovation, product confidence, managing selling risk and efficiencies in the wool handling chain	Improving wool attributes to meet customer needs through tools, technologies and information to ensure wool meets market requirements and product specifications  Develop and access new and existing markets for Australian wool and wool products through conduct market research and competitor analyses, and support product innovation, licensee partnerships and wool supply chain alliances to maintain and increase market access and diversity, the value of the Australian wool clip, and risk management options for Australian wool and wool products	Wool production forecasting and market feedback, Marketplace extension of fibre knowledge and textile innovation, Retail workshop, Market extension materials, Performance apparel and safety attributes  Health and environmental attributes and benefits of wool fibre and products, Colour trends, Trade fairs, Sustainable and ecological processing—chemicals, dyes, water and energy, Off-farm carbon footprint, garment care, decomposition and recycling  Increasing global processing capacity, Quality assurance	Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain including customers	Promote a positive profile of WA food and agriculture sectors	Increase in value of business generated through supply chains in local and international markets  NSW industries are more globally competitive  Animal welfare standards are effectively managed to allow market access and meet community expectations	Building and protecting our Tasmanian brand credentials in key markets	Ensure the SA sheep industry is a highly competitive and attractive investment destination for breeders, producers, processors and manufacturers of products	Developing new products and securing new markets  Transporting products to market	Transforming the state and regional economies and improving the standard of living and lifestyle

GROWER PRIORITIES	WORKING GROUP IDENTIFIED INDUSTRY PRIORITIES	AWI PRIORITIES	RURAL RDC PRIORITIES	DAFWA 2009-2012 STRATEGIC PLAN	NSW DPI 2010-2013 STRATEGIC PLAN	DPIPWE TAS*	SA SHEEP INDUSTRY 2003-2013 STRATEGIC PLAN	DPI VIC	DEEDI QLD 2010-2014
	Enhanced product integrity, residue management and Biosecurity through RD&E to underpin enterprise and industry systems that at least meet world's best practice for product integrity, residues and biosecurity standards to protect consumers of wool, the community and the wool industry		Biosecurity	Develop effective natural resource management policy to manage lands assets, climate variability and biosecurity Improve market access for WA producers	Risks posed by pests, weeds, diseases and chemicals to the economy, environment and community are excluded, eradicated or effectively manage	Minimising the impact of pests, weeds and disease			
Customer and consumer acceptance and confidence in the wool farming system through environmental and animal production credentials	Ethical wool production through develop and drive the implementation of wool production systems proven to at least meet the animal welfare and environmental market driven expectations of the consumer and the community.	Robust welfare standards, Wool clip quality assurance, Optimal land and resource management, Adaptability to climate change, Reducing pesticide use, Carbon credentials	Natural resource management and climate variability and climate change	Develop effective natural resource management policy to manage lands assets, climate variability and biosecurity Improve market access for WA producers	Appropriate access to and sustainable use of natural resources Industries achieve improvements in natural resource and environmental management Industries adapt to climate change, contribute to mitigation of its impacts and harness opportunities that emerge	Leading water development in Tasmania Integrating conservation of natural diversity into private land management	Enhance the positive relationship between the sheep industry and the community regarding the use of natural resources and environmental management	Understanding and managing climate change Strengthening land and water management	
Awareness and adoption of industry messages through information distribution to growers, skills development and supporting strategic thinking		AWI Extension networks, Leadership and mentoring Scholarships, training and coaching, Young grower programs, Broad access communication, Schools, Shearer and Wool handler training, Education and extension to stakeholders and the marketplace, Market intelligence and corporate functions under AWI's business objectives	Supports rural RDC priorities through innovation, skills and technology	Build capacity to adapt and grow	Science based innovation capability across NSW Jobs supported and created in urban and regional NSW	Improve the capacity of farmers to develop and apply business, planning and risk-management skills to improve enterprise and industry competitiveness	Build upon R&D and training skills which are attuned to future value chain needs	Helping farming families to secure their futures Building skills and attracting young people to farming	Create jobs and a skilled labour force

\* The Tasmanian plan is in development at the time of writing this strategy, however at the request of the Tasmanian Department, its 2007-2009 plan was referenced.

### 8.3 NATIONAL RD&E CAPABILITY TABLES AND DATA: HUMAN RESOURCES

Table 7. Agency contribution to National On-farm Wool RD&E capability

AGENCY	% OF FTE	NUMBER OF FTE	DISCIPLINE AREA WITH ≥3 FTE
<b>Universities combined (USydney, UNE, UAdelaide, UMelbourne, La Trobe, CSU)</b>	25.9%	34 FTE	Animal breeding and genetics (3 FTE)
			Animal reproduction (4 FTE)
			Animal production (4 FTE)
			Veterinary medicine (3 FTE)
			Education and extension (5 FTE)
<b>NSW: NSW DPI</b>	24.6%	32 FTE	Education and extension (16 FTE)
			Animal breeding and genetics (4 FTE)
			Animal growth and development (3 FTE)
			Parasitology (3 FTE)
<b>WA: DAFWA</b>	17.5%	23 FTE	Animal breeding and genetics (5 FTE)
			Education and extension (6 FTE)
			Animal nutrition (4 FTE)
<b>SA: SARDI/ PIRSA</b>	10.5%	14 FTE	Husbandry, welfare and behaviour (3 FTE)
			Plant improvement (5 FTE)
<b>Queensland: DEEDI</b>	6%	8 FTE	Animal breeding and genetics (3 FTE)
<b>Victoria: DPI Vic</b>	6%	8 FTE	Education and Extension (3 FTE)
<b>CSIRO</b>	5.7%	7 FTE	Education and Extension (3 FTE)
			Parasitology (3 FTE)
<b>Tasmania: DPIPWE</b>	3.6%	5 FTE	
<b>NT: DRPI</b>	0%	0 FTE	

Table 8. Individual university contribution to National On-farm Wool RD&E capability

UNIVERSITY	% OF FTE	NUMBER OF FTE
<b>USydney</b>	9.3%	12
<b>UNE</b>	9.1%	12
<b>CSU</b>	4.2%	6
<b>UMelbourne</b>	2.2%	3
<b>La Trobe University</b>	0.6%	1
<b>UAdelaide</b>	0.5%	1
<b>CSIRO</b>	5.7%	7
<b>Tasmania: DPIPWE</b>	3.6%	5
<b>NT: DRPI</b>	0%	0

Table 9. Agency contribution to National Off-farm Wool RD&E capability

AGENCY	% OF FTE	NUMBER OF FTE	Area with ≥3 FTE
<b>Deakin University</b>	45%	5 FTE	Textile technology (5 FTE)
<b>CSIRO</b>	30%	4 FTE	Manufacturing engineering (4 FTE)
<b>RMIT</b>	13%	2 FTE	-
<b>WA: DAFWA</b>	10%	1 FTE	-
<b>NSW: NSW DPI</b>	2%	< 1 FTE	-
<b>UAdelaide</b>	0.5%	1	
<b>CSIRO</b>	5.7%	7 FTE	
<b>Tasmania: DPIPWE</b>	3.6%	5 FTE	
<b>NT: DRPI</b>	0%	0 FTE	



Table 10. On-farm Wool RD&E FTE capability by Australian Standard Research Classification for 2009/10

AUSTRALIAN STANDARD RESEARCH CLASSIFICATION		FTE's BY AGENCY											TOTAL	%		
		STATE DPI's							CSIRO	UNIVERSITIES						
NUMBER	SHORT TITLE	QLD	NSW	VIC	NT	SA	WA	TAS		SYDNEY	UNE	Adel	Melb	LaTrobe	CSU	
260602	Climatology	0.24										0.2			0.44	0.3
300104	Agronomy (includes pasture establishment)												0.1		0.1	0.1
300203	Plant improvement		1			5.1	1.49	0.4							7.99	6.1
300204	Plant protection		0.3				0.2								0.5	0.4
300205	Agronomy	0.2				1.5	0.4	1.75	0.05	0.15		0.05	0.1	1.8	6.0	4.5
300299	Crop & pasture improvement (not elsewhere classified)		2						0.075						2.075	1.6
300401	Animal breeding and genetics		4.2			3	4.9		1.4	1.28	0.4	0.1		0.05	15.33	11.6
300402	Animal reproduction					0.4			3.1	0.78				0.5	4.78	3.6
300403	Animal nutrition					0.1	3.36		0.5	1.68	0.1	0.3		0.2	6.24	4.7
300404	Animal husbandry, welfare & behaviour			0.6			2.85		3.29						6.74	5.1
300405	Animal protection	1.22	0.1												1.32	1.0
300406	Animal growth and development		3.25						0.2	1.6		0.2	0.1	0.25	5.6	4.2
300499	Animal production (not elsewhere classified)	0.3							0.585	0.04	2.9	0.2	0.6	0.5	5.125	3.9
300501	Veterinary Medicine								2.55					0.6	3.15	2.4
300502	Anaesthesia & Intensive care													0.1	0.1	0.1
300503	Epidemiology								0.5					0.1	0.6	0.5
300504	Immunology											0.1			0.1	0.1
300505	Anatomy & Physiology													0.1	0.1	0.1
300506	Pathology								0.25					0.2	0.45	0.3
300507	Microbiology (excl. Virology)		0.8												0.8	0.6
300508	Parasitology	0.88	3.4			1	1.04	1	3.35	1	0.8		0.5	1.1	14.07	10.7
300509	Radiology & Imaging								0.01						0.01	0.0
300599	Veterinary sciences (not elsewhere classified)	0.14		1											1.14	0.9

300803	Natural resource management	0.08	2.25			0.74				0.2					3.27	2.5	
300901	Farm/rural management & agribusiness					0.1						0.2		0.1	0.4	0.3	
300902	Education and extension	4.6	16.08	3.8		2.8	5.77	1.6			2.6	2.17			39.42	29.9	
300903	Sustainable development	0.5	0.6						0.16	0.05	0.4				1.71	1.3	
309999	Agricultural, Veterinary & environmental Sciences not elsewhere classified												1.1		1.1	0.8	
340201	Agricultural economics		0.7	0.3											1	0.8	
350202	Business Information Systems							2.29							2.29	1.7	
Total		8.16	32.43	7.95	0	13.9	23.14	4.75		7.46	12.25	11.96	0.7	2.85	0.8	5.6	131.95
%		6.2	24.6	6.0	0	10.5	17.5	3.6		5.7	9.3	9.1	0.5	2.2	0.6	4.2	100.00

\* Data in the tables represents capability at time period collected and not current resources for 2009/10

\* DPIPWE Tasmania's human resources capabilities in wool have now been transferred to the University of Tasmania (2010/11)

Table 11. Off-farm Wool RD&E FTE capability by Australian Standard Research Classification for 2009/10

AUSTRALIAN STANDARD RESEARCH CLASSIFICATION		FTE's BY AGENCY														TOTAL	%
		STATE DPI's								CSIRO	UNIVERSITIES						
NUMBER	SHORT TITLE	QLD	NSW	VIC	NT	SA	WA	TAS	SYDNEY		UNE	Adel	Melb	LaTrobe	CSU		
290300	Climatology								3.6		3.6	30.23			0.44	0.3	
91092	Agronomy (includes pasture establishment)		0.25							5.4	1	6.65	55.84	0.1	0.1	0.1	
350210	Plant improvement						1.16				0.5	1.66	13.94		7.99	6.1	
Total		0	0.25	0	0	0	1.16	0	3.6	5.4	1.5	11.91		0.1	0.1	0.1	
%		0	2.10	0	0	0	9.74	0	30.23	45.34	12.59	100.00	0.1	0.1	0.1	0.1	

### 8.4 NATIONAL RD&E CAPABILITY TABLES AND DATA: INFRASTRUCTURE

Table 12. Agency contribution to national wool research facility infrastructure

AGENCY	NUMBER OF SITES	SITE ENVIRONMENT	At risk within 2 years?	Average % of combined sites
<b>NSW: NSW DPI</b>	9	2 Low rainfall/ rangelands 4 Mild/ warm temperate 3 Cold/ cool temperate	No	used for wool research
<b>SA: SARDI/ PIRSA</b>	4	3 Cold/cool temperate 1 Mediterranean	No	43%

<b>WA: DAFWA</b>	3	2 Mediterranean 1 Cold/cool temperate	No	32%
<b>Queensland: DEEDI</b>	3*	2 Sub tropical 1 Low rainfall/ rangelands	No	45%
<b>Victoria: DPI Vic</b>	2	Cold/ cool temperate	No	50%
<b>CSIRO</b>	2*	Cold/ cool temperate	No	8%
<b>Tasmania: DPIPWE</b>	1*	Cold/ cool temperate	No	75%
<b>Universities</b>				0%

\* One site included in this count is identified as currently not used for wool research.

Table 13. National Infrastructure for Wool RD&E

	NAME OF FACILITY	GENERAL DESCRIPTION	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	Farming System (research stations)	Carrying capacity DSE/ha (research stations)	FACILITY LEASED OR OWNED BY AGENCY	CONDITION OF ASSET	SPECIFIC ATTRIBUTES THAT THE ASSET OFFERS TO THE RD&E STRATEGY	PRIORITY FOR RETENTION IN NEXT 5 YEARS	SHEEPMEAT	WOOL	TOTAL
<b>Qld: DEEDI</b>	EcoSciences Precinct	Laboratory and office facility	Brisbane 4000	Tropical/Sub tropical		0 DSE	Collaboratively owned by DEEDI, Qld Dept of Environment and Resource Management and CSIRO	Average	Modern (2010) laboratory facilities supporting ruminant nutrition, parasitology and pasture research, includes Wormbuster testing and advisory service	High	0.5	0.5	1
	CAAS (Centre for Advanced Animal Science) Gatton	Animal research facility (yards, pens, laboratories)	Gatton 4243	Tropical/Sub tropical		100 DSE	Collaboratively owned by University of Queensland and Queensland Government	Good	Modern facilities (2008) for animal production, health and welfare and biosecurity research, small and individual pens and small paddocks for intensive research	High	2.5	2.5	5
	Rosebank Research Station	6907 ha cattle and sheep research station for applied paddock scale research	Longreach 4730	Low rainfall / Rangelands	Extensive grazing	4000 DSE	Owned	Good	Well equipped rangeland research facility close to a major regional centre (Longreach) and Agricultural college	Medium	0	0	0
<b>NSW: NSW DPI</b>	Glen Innes Agricultural Research and Advisory Station	585 ha high rainfall station for grazing research and pasture research	Glen Innes 2370	Cold/Cool Temperate	Extensive grazing	7500 DSE	135 ha leased 450 ha owned by NSW DPI	Good	Good infrastructure, modern cattle and sheep yards, shearing shed, glasshouses, highly improved, heavy basalt soil, high quality, safe temperate grazing	High	20	10	30
	Elizabeth Macarthur Agricultural Institute	1600 ha Centre for Animal and Plant Health, centre for NSW veterinary research and diagnostic services with large animal grazing capability and irrigated pastures	Camden 2570	Mild/Warm Temperate	Extensive grazing	8 DSE	Owned	Good	Parasitology research, CAT scanning capability, maintenance of original Macarthur sheep bloodlines	High	2.5	2.5	5
	Trangie Agricultural Research Centre	3900 ha facility, focus on rangeland management, Merino genetics research, development of conservation-farming technology	Trangie 2823	Low rainfall / Rangelands	Mixed farming	12000 DSE	Owned	Good	High security irrigation water for fodder production available, well supplied with paddocks, yards and associated infrastructure, extensive infrastructure (offices, workshops, library, seminar facilities)	High	20	20	40



NAME OF FACILITY	GENERAL DESCRIPTION	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	Farming System (research stations)	Carrying capacity DSE/ha (research stations)	FACILITY LEASED OR OWNED BY AGENCY	CONDITION OF ASSET	SPECIFIC ATTRIBUTES THAT THE ASSET OFFERS TO THE RD&E STRATEGY	PRIORITY FOR RETENTION IN NEXT 5 YEARS	SHEEPMEAT	WOOL	TOTAL
Cowra Centre for Sheepmeat Development	375 ha Centre for Sheep Meat Development, focus on genetics, meat quality, nutrition, reproduction, lamb survival and market development, large scale crop and pasture management demonstrations	Cowra 2794	Mild/Warm Temperate	Mixed farming	10 DSE	305 ha owned 70 ha leased	Good	Excellent research facilities, supported by ISO 9001 accredited meat laboratory in DII, quality uniform land for trials, conference and meeting room facilities, good livestock/ sheep handling facilities	High	73	10	83
Orange Agricultural Institute	140 ha improved pasture paddocks, animal handling facilities and laboratory	Orange 2800	Cold/Cool Temperate	Extensive grazing	600 DSE in summer 300 DSE in winter	Crown Land 'owned' by NSW DPI	Good	Laboratory and office space, farm support staff, sheep quarantine areas, shearing shed with space for sheep pens	Medium	0	20	20
AGBU and the National Centre for Rural Greenhouse Gas Research	Joint centre between NSW DPI and UNE, focus on research to reduce agricultural greenhouse gas emissions, sequester carbon in soils and develop new biofuels, includes 36 ha demonstration site	Armidale 2350	Cold/Cool Temperate		0 DSE 5 DSE on demonstration site	Joint facility NSW DPI and UNE	Good	Team of 20 scientists, postgraduate students and support staff, international reputation and an active program of visiting scientists	High	20	20	40
Yanco, Centre of Excellence for Rice and Horticulture	800 ha dryland and 1860 ha capable of flood irrigation, sown to lucerne based pastures in rotation with cereal crops, cattle and sheep handling facilities, laboratory facilities and equipment	Leeton 2705	Low rainfall / Rangelands	Mixed farming	5750 DSE across Yanco and LFS	1150 ha owned	Good	High security irrigation water, capacity for surplus water use from Griffith Research Centre, MN2 BJD status, good animal handling facilities, and extensive general infrastructure, all fodder home grown, commercial sale prime lucerne hay produced	High	30	30	60
Centre of Excellence for Southern Farming Systems Wagga Wagga	895 ha Centre of Excellence for Southern Farming Systems and Viticulture, primarily plant breeding and evaluation programs, ruminant nutrition and feed quality analysis, state-of-the-art animal nutrition research facility	Wagga Wagga 2650	Mild/Warm Temperate	Mixed farming	1000 DSE	Owned	Good	Animal nutrition research facilities, supported by high quality laboratory analytical capability, uniform land for trials, conference and meeting room facilities, potential access to general security irrigation water, good livestock handling facilities	High	5	0	5

	NAME OF FACILITY	GENERAL DESCRIPTION	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	Farming System (research stations)	Carrying capacity DSE/ha (research stations)	FACILITY LEASED OR OWNED BY AGENCY	CONDITION OF ASSET	SPECIFIC ATTRIBUTES THAT THE ASSET OFFERS TO THE RD&E STRATEGY	PRIORITY FOR RETENTION IN NEXT 5 YEARS	SHEEPMEAT	WOOL	TOTAL
	Condobolin	1700 ha primarily livestock, agronomy, forage shrub and oilseed research, large scale crop and livestock system demonstrations	Condobolin 2877	Mild/Warm Temperate		3000 DSE	Owned	Good	High level of subdivision suitable for sheep research	Medium	20	30	50
<b>SA: SARDI/PIRSA</b>	Struan Research Centre	250 ha facility and 307 ha at nearby Kybybolite Research Centre for sheep	Naracoorte 5271	Cold/Cool Temperate	Mixed farming	10000 DSE	Main research properties owned plus some short term leases for cattle breeding	Cattle facilities state of the art Good-average	Technograzing area and replicated grazing trials, irrigation security, licensed feedlot, located near major export abattoirs, subdivided suitable for single sire mating groups, shearing shed and handling facilities, modern woolshed and undercover yards	High	30	10	40
	Minnipa Agricultural Centre	1000 ha broad acre facility		Mediterranean	Mixed farming	1000 DSE	Facility Owned by Agency	Good	Low rainfall asset with potential to evaluate grazing management strategies and associated environmental impacts, modern woolshed and yards with associated feedlot area, undercover sheep management area	High	10	10	20
	Turretfield Research Centre	650 ha facility, adjoins 400 ha Kingsford property, with operational Reproductive Biology laboratory	Rosedale 5350	Mediterranean	Mixed farming	8000 DSE total	Research properties owned	Sheep facilities state of the art	Single-sire mating paddocks (46), electronic ID facilities, 200 person shearing shed	High	35	35	70
	Molecular Biology Laboratory	Molecular Biology Laboratory	Roseworthy 5371				Owned	Good	Ability to conduct advanced molecular biology techniques including quantitative real-time PCR	High	40	0	40
<b>WA: DAFWA</b>	Katanning Research Station	1400 ha sheep breeding research facility	Katanning 6317	Mediterranean	Mixed farming	8000 DSE	Owned	Good	Well sited close to large regional centre and mixed sheep & cropping zone, sheep yards; animal house; two shearing sheds; mating paddocks, improved pastures, farmlet-sized paddocks, DEXA machine	High	40	10	50
	Medina Research Station	Intensive animal research facility (pigs, sheep & poultry)	Medina 6167	Mediterranean	Mixed farming	8000 DSE	Owned	Good	Well equipped intensive animal research facility, used primarily for pigs, sheep animal house (15 yo) and metabolism building (14 yo), agreed as a Core Facility for national pork R&D strategy, pig/early weaning nutrition, environmental management	High	30	5	35

	NAME OF FACILITY	GENERAL DESCRIPTION	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	Farming System (research stations)	Carrying capacity DSE/ha (research stations)	FACILITY LEASED OR OWNED BY AGENCY	CONDITION OF ASSET	SPECIFIC ATTRIBUTES THAT THE ASSET OFFERS TO THE RD&E STRATEGY	PRIORITY FOR RETENTION IN NEXT 5 YEARS	SHEEPMEAT	WOOL	TOTAL
	Mt Barker Research Station (Main farm and Manurup farm)	1800 ha sheep and cattle production and disease prevention research facility	Mt Barker 6324	Cold/Cool Temperate	Mixed farming	8500 DSE main farm 4000 DSE Manurup farm	Owned	Good (Main farm) Average (Manurup farm)	120 ha perennial pasture, 1680 ha clover and ryegrass, two shearing sheds with large undercover holding yards, cattle yards with scales and crush, 24 X 2 ha mating/lambing paddocks, nationally funded genetics	High	20	60	80
<b>TAS: DPIPWE</b>	Cressy Research Station	600 ha production facility for beef, sheep and plants	Cressy 7302	Cold/Cool Temperate	Mixed farming	20 DSE	Owned	Good	Close to Animal Health facility at Launceston	High	0	0	0
<b>VIC: DPIVIC</b>	Biosciences Research Centre	Research facility targeting genomic and genetic research on plants (pastures) and animals	Melbourne 3000	Cold/Cool Temperate	Mixed farming	0 DSE	Owned	Good	Genetic & genomic research in animals and plants	High	35	5	40
	Pastoral Research Institute	Research facility targeting applied research in sheepmeats and field testing of plant genetic selections	Hamilton 3300	Cold/Cool Temperate	Mixed farming	10000 DSE	Owned: collaboration between DPI Vic and La Trobe University	Good	Applied research in sheepmeats and field testing of plant genetic selections	High	85	5	90
<b>CSIRO</b>	F D McMaster Laboratory	Specialist sheep experimental and breeding facilities, specialist sheep related laboratories including wool laboratory	Armidale 2350	Cold/Cool Temperate	Grazing	14000 DSE	Owned	Good	Sheep & cattle production and disease prevention research	High	10	30	40
	Ginninderra Experiment Station	Research facility focus on sheep feedbase experiments	Hall 2618	Cold/Cool Temperate	Grazing	4000 DSE	Owned	Good	Experimental studies focussed on plant/animal interactions, located near Canberra	High	0	0	0

### 8.5 NATIONAL RD&E CAPABILITY TABLES AND DATA: FLOCKS

Table 14. Agency contribution to national wool research flocks

RESOURCE	FLOCKS	ENVIRONMENTS	EWE NUMBERS	% OF NATIONAL FLOCK (PER HEAD BASIS)	AT RISK WITHIN 2 YEARS?	PEDIGREED?
<b>University of New England</b>	2	Cold/cool temperate	7000	18.7%	No	Yes
<b>NSW: NSW DPI</b>	6	2 Mild/ warm temperate 1 Cold/cool temperate 3 Low rainfall/ rangelands	6000	16%	At risk:1 flock	Yes
<b>Victoria: DPI Vic</b>	7	4 Cool temperate 3 Cool temperate	5365	14.3%	No	Yes
<b>CSIRO</b>	6	Cool temperate	5306	14.2%	No	Yes

<b>University of Melbourne</b>	1	Cool temperate	5000	13.3%	No	-
<b>QLD: DEEDI</b>	1	Low rainfall/ rangelands	4000	10.7%	Medium	Not used for research
<b>WA: DAFWA</b>	4	2 Mediterranean 2 Cold/cool temperate	2450	6.5%	No	Yes
<b>SA: SARDI/ PIRSA</b>	7	6 Mediterranean 1 Cold/cool temperate	2340*	6.3%	At risk:1 flock	Most
<b>Tasmania: DPIPWE</b>	0	-	-	0%	-	-

\* SARDI/ PIRSA hold an additional 2000 head in the Merino Resource flock for data only



**Table 15. National Flocks held for Wool RD&E**

LOCATION - NAME OF RESEARCH FACILITY ON WHICH LOCATED	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	RESEARCH DATA HELD ON ANIMALS (INCLUDING HISTORICAL DATABASES)	SPECIFIC ATTRIBUTES THAT THE LIVESTOCK OFFERS TO RDE STRATEGY	LIKELIHOOD OF RETENTION OVER 2 YEARS?	COMMENT
Rosebank Research Station	Longreach 4730	Low rainfall / Rangelands		Not currently used for research	Medium	
Cowra Centre for Sheepmeat Development	Cowra 2794	Mild/Warm Temperate	Full pedigree data, 150 measured traits. Linked to Sheep Genetics database and sheep genomics	Unique resource expressing the industry genetic diversity	High	
Trangie Agricultural Research Centre	Trangie 2823	Low rainfall / Rangelands	Full pedigree data, 150 measured traits. Linked to Sheep Genetics database and sheep genomics	Unique resource expressing the industry genetic diversity	High	
Trangie Agricultural Research Centre	Trangie 2823	Low rainfall / Rangelands		Commercial	High	
Trangie Agricultural Research Centre	Trangie 2823	Low rainfall / Rangelands	Full pedigree data	Divergently selected for fleece rot and/or flystrike for 30 years	Low	
Condobolin, Trangie, Yanco, Leeton, Wagga Wagga	Various	Mild/Warm Temperate		Commercial	Med	
Orange Agricultural Institute	Orange 2800	Cold/Cool Temperate		Commercial, used for some Precision Sheep Management work.	Med	
Minnipa Ag Centre	Minnipa 5654	Mediterranean	Wool testing data	Security and experienced staff	Medium	
Minnipa Ag Centre	Minnipa 5654	Mediterranean	Wool testing data		High	
Minnipa Ag Centre	Minnipa 5654	Mediterranean			Low	
Turretfield Research Centre	Rosedale 5350	Mediterranean	SA Merino Strain Trial 1970-1980 Merino Resource (Base) Flock 1986-1996	Data can provide answers on genetic differences between strains for a variety of traits. Fully pedigreed & good structure for genetic estimates. Resource for estimating genetic change in retrospect		Data unpublished. The main results are published, but the large database, incorporating the SDFs, contains a number of opportunities for further data analysis and reporting.
Turretfield Research Centre	Rosedale 5350	Mediterranean	Selection Demonstration Flocks (SDFs) 1996 to present	Fully-pedigreed flock of 300 ewes and rams still maintained on research centre. Registered with Sheep Genetics	Medium	Main results reported in project newsletters & at conferences, full journal papers pending, flock is in top 5% of SG flocks for the 7% Dual Purpose Index
Turretfield Research Centre	Rosedale 5350	Mediterranean	Sheep CRC Information Nucleus Flock	Fully-pedigreed flock - ongoing research as part of CRC. Linked to SDFs	High	Half of the SA contribution to this program is located at Turretfield, other half at Struan
Struan Research Centre (incorporating Kybybolite)	Naracoorte 5271	Cold/Cool Temperate	Sheep CRC Information Nucleus Flock	Fully-pedigreed flock (500 sheep)- ongoing research as part of CRC	High	In addition to sheep currently involved in research, there are another 4,200 sheep
Katanning Research Station	Katanning 6317	Mediterranean	Full pedigree- Link to Sheep CRC - 150 plus traits measured	Unique resource on wool, growth, meat and conformational traits expressing the industry genetic diversity	High	Important base for methane studies
Katanning Research Station	Katanning 6317	Mediterranean	Sire pedigree- Link to AMSEA and Sheep Genetics - major production traits measured	Unique resource on wool, growth, carcass and conformational traits expressing the industry genetic diversity	Medium	

LOCATION - NAME OF RESEARCH FACILITY ON WHICH LOCATED	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	RESEARCH DATA HELD ON ANIMALS (INCLUDING HISTORICAL DATABASES)	SPECIFIC ATTRIBUTES THAT THE LIVESTOCK OFFERS TO RDE STRATEGY	LIKELIHOOD OF RETENTION OVER 2 YEARS?	COMMENT
Mt Barker Research Station	Mt Barker 6324	Cool Temperate	Full pedigree - Sheep Genetics database. Large range of production, visual and disease traits	All animals characterised and evaluated for breech strike resistance. Wide diversity in breech strike resistance.	High	Unique resource to elucidate underlying mechanisms of breech strike
Mt Barker Research Station	Mt Barker 6324	Cool Temperate	Full pedigree - Sheep Genetics database. Large range of production, visual and disease traits	Most worm resistant Merino flock selected for 23 years for low worm egg count. Recently also selected for reduced dags and improved production traits.	High	Unique resource to elucidate underlying mechanisms for hypersensitivity scouring studies which is the most important trait in making animals more susceptible to breech strike
Cressy Research Station	Cressy 7302	Cool Temperate	None	None from a historical record perspective. Could be selected as representative of a particular line or breed commercially available	High	
Hamilton Research Institute	Hamilton 3300	Cool Temperate/ Wet temperate coast	Some pedigree data, 150 measured traits. Linked to Sheep Genetics database and sheep genomics	Unique resource expressing the industry genetic diversity	High	
Hamilton Research Institute	Hamilton 3300	Cool Temperate/ Wet temperate coast	Some pedigree data, 150 measured traits. Linked to Sheep Genetics database and sheep genomics	Unique resource expressing the industry genetic diversity	High	
Hamilton Research Institute	Hamilton 3300	Cool Temperate/ Wet temperate coast	Some pedigree data and production records linked to EverGraze project	Selected high performance ewes as part systems research self replacing maternal composite ewe flock	High	
Hamilton Research Institute	Hamilton 3300	Cool Temperate/ Wet temperate coast	Run as straight commercial flock		High	
Rutherglen	Rutherglen 3685	Cool Temperate/ Temperate slopes and plains	Information Nucleus Flock and feed intake data	Fully Phenotyped & feed intake data	Medium	
Rutherglen	Rutherglen 3685	Cool Temperate/ Temperate slopes and plains	Information Nucleus Flock and feed intake data	Fully Phenotyped & feed intake data	Medium	
Rutherglen - off site at Chiltern EverGraze site	Rutherglen 3685	Cool Temperate/ Temperate slopes and plains	Wool production data	Selected high performance ewes as part systems research	Medium	
F D McMaster Laboratory	Armidale 2350	Cold/Cool Temperate	Pedigree & faecal egg count data	Trichostrongylus selection line	High	

LOCATION - NAME OF RESEARCH FACILITY ON WHICH LOCATED	LOCATION - NEAREST TOWN AND POSTCODE	AGRO-ECOLOGICAL ZONE	RESEARCH DATA HELD ON ANIMALS (INCLUDING HISTORICAL DATABASES)	SPECIFIC ATTRIBUTES THAT THE LIVESTOCK OFFERS TO RDE STRATEGY	LIKELIHOOD OF RETENTION OVER 2 YEARS?	COMMENT
Kirby Research Station	Armidale 2350	Cold/Cool Temperate	Sheep CRC Information Nucleus Flock and full genotype on 60% of animals	Known phenotype and genotype from Sheep CRC Information Nucleus Flock and Australian Merino Sire Evaluation	High	
CSIRO Livestock Industries	Armidale 2350	Cold/Cool Temperate	Pedigree & faecal egg count data	Haemonchus selection line	High	
CSIRO Livestock Industries	Armidale 2350	Cold/Cool Temperate	Pedigree & wool traits	Ultra fine wool line	High	
CSIRO Livestock Industries	Armidale 2350	Cold/Cool Temperate	Pedigree, wool, wrinkle & breech traits	Breech trait selection	High	
CSIRO Livestock Industries	Armidale 2350	Cold/Cool Temperate	Pedigree only	Cross bred resource flock	High	
Ginninderra Experiment Station, Canberra	Hall 2618	Cold/Cool Temperate	Nil - flock improvement is via acquisition of leading rams of a particular bloodline	Core is a fine wool flock is of a particular bloodline and is used to generate uniform, industry-relevant animals for feedbase experiments	High	
Dookie Campus, University of Melbourne	Dookie 3646	Cold/Cool Temperate	Wool traits	Flock used for sire evaluation of wool production traits	High	





### 8.7 RISKS ASSOCIATED WITH THE CHANGE MODEL

Table 16. Risk and aversion strategies for the change model

RISK	LIKELIHOOD	IMPACT	AVERSION STRATEGY
<b>AWI withdraws as forum coordinator</b>	Low	High	Statutory Funding Agreement with the Commonwealth requires "A Strategic Plan should be prepared in accordance with good planning practice and with a program framework" and "collaboration with other RDC's on priority research and development issues". Thus if other RDCs have adopted good planning practice and a program framework under a national sector specific system, AWI needs to be part of a process relevant to the national wool RD&E delivery sector. AWI has also signed a Statement of Intent with the Commonwealth that it will participate in a National Wool RD&E Strategy.
<b>Major role agency (DAFWA) or NSW DPI withdraw as forum organisers</b>	Low	High	DAFWA and NSW DPI have committed to taking the lead agency role for the implementation phase of the Strategy. Ensure ongoing support from Working Group and communication with AWI.
<b>Major role agencies withdraw as forum members</b>	Low	High	Reduce the complexity and time requirement of the forum task by keeping the event small (2 attendees per agency, one day forum) and maximising the use of pre forum reading material and requests for information by email.

<b>Major and support agencies withdraw from reporting functions</b>	Low	High	Reduce the complexity and time requirement of the reporting task by keeping the forum agenda simple and achievable and reporting annually.
RISK	LIKELIHOOD	IMPACT	AVERSION STRATEGY
<b>Non agreement to the project priorities under the program framework</b>	Low	High	Utilising existing individual agency investment alignment to create detail the program framework rather than starting with new priorities. AWI to communicate its marketing strategy (supported by the analysis in the sector overview of this strategy and AWI's own market analysis in its Strategic Plan 2010-2013).
<b>Forum findings not used to inform agencies RD&amp;E investment decisions</b>	Mod	High	Monitoring of participants' own investment priorities mapped against the implementation of the program framework with reporting to all stakeholders. Loss of reputation is a disincentive to non contribution to a publically available agreed strategy. Preparedness to review the program framework if participant's priorities become misaligned over time due to a changing wool sector environment.
<b>Non contribution from agencies</b>	Low	High	Loss of reputation is a disincentive to non contribution to a publically available agreed strategy.
<b>Inability to accurately collect baseline data against which progress is measured</b>	Low	High	Ensure the complexity of data required is low and easily reportable, e.g. valuing of investment, total number of projects under the framework, number of collaborative projects, number of contracts involving commercial partners, number of contracts incorporating extension elements, number of centralised project management activities, number of shared economic evaluation activities.

## 8.8 CURRENT EXTENSION ACTIVITIES

### 1. State agencies

- Have varied levels of investments in extension. Victoria and NSW have the higher personnel levels and this increases their ability to deliver extension activities
- Distance and scale of the industry across the states impact on the extension techniques used and the staffing levels
- Most states have industry supported extension staff or programs to support producers
- Extension staff often work across industry sectors as a result of servicing particular regions or technical areas.
- Have state specific extension programs
- Local agency staff have strong relationships with producers and an ability to influence their involvement in activities

### 2. RDC

- AWI has made a significant investment in state extension networks over the past 8 years, which are delivered in partnership with state agencies or private consultants. Two of the networks (Vic and pastoral) have been running for 12 years
- MLA has contributed to the networks in various forms and will continue to provide ad hoc investment to the networks through workshop delivery

or development of training materials.

- Both AWI and MLA invest in Making More from Sheep in collaboration with state agencies and private consultants for state delivery. The focus is on whole of sheep enterprises
- AWI will continue to provide both single and ongoing opportunities for producer involvement in extension
- The trend is also towards branded extension products with well known examples including Wormboss, Making More From Sheep and Lifetime Ewe Management. The RDC and state agency role is increasingly focused on updating the technical aspects of the extension message with delivery through consultants funded by a mixture of user pays and subsidy from government or RDC. Ongoing investment in these successful branded products is cost efficient and low risk as they have been extensively trailed and refined, are well recognised by growers and the extension professionals

### 3. Universities

- Currently have a limited involvement in extension delivery although provide an invaluable technical role support for extension
- Are an under utilised and under resourced opportunity for extension to the wool industry
- The Australian Wool Education Trust (AWET) uses income, derived from seed funding from Australian Wool Testing Authority of \$3 million and Australian Wool Innovation of \$4 million, to provide funds to

schools, the vocational and tertiary (undergraduate and postgraduate) education sector with the objective of supporting those individuals capable of contributing to the future development of the wool industry

### 4. CRC's - Sheep, IACRC, FFI

- Deliver extension activities that AWI, MLA and state agencies contribute to and collaborate with under a Participant's Agreement pledging in kind and/or cash
- Utilise a broad range of programs and networks that already exist in the industry
- Are focused directly towards their own programs

### 5. CSIRO

- Currently have a limited involvement in extension delivery although provide an invaluable technical support role for extension
- Are an under utilised and under resourced opportunity for extension to the wool industry

### 6. Private sector

- Play an increasing role in extension for the industry as well as advising on more intricate elements of producers businesses
- An influential sector including individuals, small business and agri-business houses
- Valuable supporter and promoter of extension activities

### 7. Producers/Groups

- Many producers are involved in multiple groups or activities that can be topic specific or broad production groups
- Are facing increased pressures for attention and time
- Are strong influencers for other producers participation in activities. Growers often act as advocates for programs or research outcomes and are profiled in case studies
- Ability to pay for extension services varies, although there is some willingness. BestWool/BestLamb survey of membership revealed a limit of \$400 per year for extension

### 8. Education of fibre knowledge and textile innovation

Educating the trade falls within the role of AWI and is required to support the product marketing for innovations in fashion apparel, performance apparel and environmental and health benefits. This requires an improved understanding of the competitive advantages of wool, better equipped sales staff at retail level and more confidence and ability to use wool in products. The target market are retailers and brand owners through trade fairs, retail workshops supported by product marketing materials and colour trend information.

Defining consumer requirements from products made of wool and monitoring levels of knowledge and satisfaction in regards to the role and benefits of wool is also conducted by AWI.

WOOL INDUSTRY

National Research, Development and Extension Strategy

June 2011