NATIONAL WOOL
RD&E STRATEGY

WOOL INDUSTRY –
NATIONAL RD&E STRATEGY
2018-2022

APRIL 2018

TABLE OF CONTENTS

NATIONAL WOOL INDUSTRY RD&E STRATEGY 2018-2022

The focus of this National Wool Industry RD&E Strategy is to help guide investments to increase the value of the sheep and wool industry to the Australian economy and to Australian wool producers. The following diagram summarises the key targets of the Strategy:

Vic $2.1bn in 2016	**2016 dollars**	SA $982.1m in 2016
NSW $1.7bn in 2016	**National GVAP from sheep maintained in real terms between 2016 and 2030**	TAS $170.6m in 2016
WA $1.2bn in 2016		QLD $120.4m in 2016

1. **Productivity:** by 2030 marking rates increase 0.5% pa; Merino survival rates increase by 0.2% pa (lamb), 0.13% (hogget); 0.1% (adult); proportion hogget ewes mated increase by 0.5% pa; average cut/head maintained at 4.5kg; overall sheep numbers increase by 0.7% pa

2. **Adoption:** by 2022 25% of Merino ewes managed using LTEM recommendations, number of Merino ewes scanned and differentially managed increase from 25% to 34%, 50% of Merino producers using genetic tools in ram purchases

3. **Capacity and confidence:** by 2022 producer confidence in industry increases, new labour saving technologies available

4. **Risk management:** by 2022 producers have tools to comply with health and welfare standards, 80% of producers have knowledge and skills to manage climate variability, investment in biosecurity sufficient for EADRP

5. **Value chain:** by 2022 testing/wool selling costs at or below 2015 levels, relative cost of wool harvesting below 2015 level, 90% of wool sold with NWD

6. **Market positioning:** by 2022 improve wool's environmental footprint rating

– Sheepmeat specific RDE

 – Wool and meat marketing activities

– Market access and trade liberalisation activities

ACRONYMS

AGSOC	Agriculture Senior Officials' Committee
AWI	Australian Wool Innovation
AWET	Australian Wool Education Trust
AWEX	Australian Wool Exchange
AWTA	Australian Wool Testing Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSU	Charles Sturt University
DAFWA	Department of Agriculture and Food WA
DEDJTR	Department of Economic Development, Jobs, Transport and Resources (Vic)
DPIRD	Department of Primary Industries and Regional Development (WA)
EADRP	Emergency Animal Disease Emergency Response Plan
EMI	Eastern Market Indicator (of wool price)
FAWO	Federation of Australian Wool Organisations
FTE	Fulltime employee (equivalents)
GVAP	Gross value of agricultural production
MLA	Meat & Livestock Australia
NSW DPI	New South Wales Department of Primary Industries
NWD	National Wool Declaration
PIRSA	Department of Primary Industries and Regions, South Australia
QDAF	Queensland Department of Agriculture and Fisheries
RD&E	Research, Development and Extension
SARDI	South Australian Research and Development Institute
Sheep CRC	Sheep Cooperative Research Centre
SISP	Sheepmeat Industry Strategic Plan
TIA	Tasmanian Institute of Agriculture
UNE	University of New England
UWA	University of Western Australia
WPA	Wool Producers Australia

01

INTRODUCTION

The original National Wool RD&E Strategy was published in June 2011. It was developed under the National Primary Industries Research, Development and Extension (RD&E) Framework, as one of 14 sectoral and four cross-sectoral strategies created to 'encourage greater collaboration and promote continuous improvement in the investment of RD&E resources nationally'[1].

This revised version of the Strategy was published in April 2018, following a comprehensive review process overseen by a Steering Group of the parties to the Strategy. A description of the process adopted for the re-write and the organisations involved is provided in Appendix 1.

The purpose of this Strategy is to establish a framework to guide investment in RD&E so that the Australian wool industry can:

– Identify its RD&E priorities and future direction;

– Clarify the linkages between existing R&D and industry-sector strategies, and other relevant documents;

– Have the tools, resources and information available in the future to enable informed decision making;

– Monitor and evaluate its RD&E programs;

– Support national priority needs (e.g. emergency management, market access); and

– Maintain and improve market access and consumer confidence.

1 www.agriculture.gov.au/ag-farm-food/innovation/national-primary-industries

02

WOOL INDUSTRY SITUATION ANALYSIS – AT A GLANCE

A comprehensive situation analysis is included as Appendix 2 to this report. Key components of that analysis are:

2.1 AUSTRALIAN WOOL'S PLACE AS A WORLD TEXTILE FIBRE

– Wool production has been falling globally due to low prices and perceived higher profitability of other enterprises, notably cropping and lamb production.

– Australian wool production and sheep numbers have followed global trends. Shorn wool production in Australia fell from a record level of 1,029 mkg greasy in the 1989/90 season to 325 mkg greasy in 2015/16.

– However, after two decades of decline, global wool production has stabilised over the past seven years at around 1,100-1,150 mkg clean.

– While world wool production and sheep numbers have stabilised, world production of other fibres, particularly of man-made fibres, continues to grow.

– The Australian wool clip has been trending genetically finer since the early 1990s with a significant shift towards production of superfine wool (18.5 micron and finer), away from medium Merino wool (21 to 23 micron). There has also been an increase in production of crossbred and broader wool.

– Demand for wool continues to be at the mercy of macro-forces which are outside the control and influence of wool producers. Consumer demand for wool products is significantly influenced by local economic conditions, fashion trends, retail prices and competition from products of other fibres.

– One factor which has had an influence on the demand for wool and on wool prices in the past is the relative prices for competing fibres, notably cotton and synthetic fibres. However, the impact of the relative price of these competing fibres appears to have waned.

– Based on global trade data, knitwear and men's suits, jackets and trousers provide a solid foundation for wool use, while wool's volume and share in most women's wovenwear has been eroded by price competition and a trend to 'fast fashion' retailing.

– Casualisation and active leisure wear are a natural fit for Australia's growing superfine wool component.

– These opportunities, as well as sustained consumption in the major advanced economies, will be aided by promotion of wool to consumers. The latter will be needed to highlight the value attributes of wool products targeted at their key requirements.

2.2 WOOL HARVESTING AND SELLING

– The aggregate cost of harvesting wool from the sheep's back through to delivery to the 'mill door' in 2013/14 was around $2.63/kg greasy. This is 12% higher than the level it was four years previous in 2009/10.

– Shearing remains the most significant cost for growers in delivering their wool from the sheep's back to the mill and accounts for 64% of these total costs and around one quarter of the average price received at auction.

– The total selling costs (i.e. between shearing shed door and ship's rail) in 2013/14 amounted to $0.95/kg greasy or $167/bale (transport, warehousing, testing charges, insurance, selling and buying commissions, showfloor costs, AWEX fees, Wool Levy).

– Total wool harvesting and selling costs amounted to 38% of the average price received at auction.

– 85 to 90% of Australia's wool is sold at auction.

2.3 FLOCK SIZE, PRODUCTION AND PRODUCERS

– Between 1990 and 2015, the Australian sheep population declined from 170 million to 70 million, an overall decline of nearly 60%.

– Breeding ewes and lambs have increased as a proportion of the flock at the expense of wethers as sheep meat has risen in importance as a revenue stream.

– Merino ewes, however, still account for about three quarters of all breeding ewes.

– Between 1991 and 2000, the number of specialist sheep producers declined as they quit sheep or moved into cropping, and then from 2000 onwards the number of specialist sheep producers remained almost unchanged while mixed enterprise producer numbers reduced as farms were aggregated without increasing flock size.

– Lamb production has replaced mutton turn-off resulting in an increase in product quality (and value).

– The transition from a wool-driven sheep industry to a dual-product (wool plus lamb) industry is reflected in the converging value of each commodity where sheepmeat now has a higher gross value of production (GVP) than wool.

– Over three decades to 2011, the number of farmers in Australia declined 40% while the median age increased by nine years to 53, with the proportion of farmers under 55 years of age diminishing considerably.

– There is a significant ongoing change in the provision of support services (especially extension and advice) for farmers – moving from the public to the private sector.

2.4 FUTURE DRIVERS

In early 2015, the NSW Government received a report entitled 'NSW Wool Industry and Future Opportunities'[2] which considered what the NSW wool industry might look like in 2025, and how producers, industry and NSW Government should respond to address challenges and embrace opportunities.

While the focus of that report was the NSW wool industry, the issues and implications are equally applicable to the entire Australian wool industry.

That review included a situation analysis of the wool industry of 2014/15, which has been incorporated into this Strategy. The analysis also sought to identify the drivers of change in the wool industry over the next decade. It strongly suggested that in 2025 the wool industry will be shaped by the following key forces:

– Price pressures from retail back to the producer will remain intense – that is, producers' terms of trade will continue to tighten.

– Production conditions will be more variable as climate change takes hold.

– The trend towards casualisation in consumer markets will continue, shifting demand away from some of wool's traditional market segments and towards active-leisure wear.

2 NSW DPI (2015), 'NSW Wool Industry and Future Opportunities'. A report to NSW DPI from Miracle Dog, Poimena Analysis, Scott Williams Consulting and DAFWA

– Product quality, provenance and sustainability will assume increasing importance, as will high animal welfare and ethical production standards, which will be required to maintain the industry's social licence to operate.

– Demand for sheepmeat will continue to grow, particularly from export markets.

Given these conditions, the NSW Report hypothesised that it is likely that the successful wool producer of 2025 will:

– Determine the optimum balance between sheep and other enterprises on their farm, and between wool, sheep meat and livestock trading, based on a considered, well-informed and objective long-term view of the respective industries, resource capability and personal preferences.

– Understand the target product segment for their annual wool production, such as the active-leisure knitwear sector, and structure their wool production and husbandry practices to produce wool with the specifications required by that main product segment.

– Conduct annual production and financial analyses to monitor progress against business plans, adjusting as needed.

– 'Know what they need to know' to successfully run their business – and source these skills either by their own professional development, or by retaining expert advisers where needed.

– Have in place a sheep genetic improvement program optimised to the enterprise mix of the business and target market segment(s).

– Adopt a continuous improvement mindset where productivity improvements are vigorously and relentlessly pursued.

– Participate in, and meet the standards of, an Australian wool industry provenance/ sustainability scheme which has credibility in the eyes of customers in their target market for wool.

– Actively manage production and price risk through flock structure, stocking rate, feed conservation / fodder purchases and use of price risk management tools.

– Have sourced and structured the financial capacity required to put their plans into practice.

– Have developed and adopted a clear succession plan in conjunction with their family and/or business partners.

A listing of the brief scenarios developed for the NSW Report is included as Appendix 3.

WOOL RD&E SITUATION ANALYSIS

3.1 WOOL RD&E INVESTMENT AND CAPABILITY

In the preparation of this Strategy, a survey was undertaken to assess the level of investment, human resources (and capability), facilities and flocks dedicated or in part available to the wool industry. Full details are provided in Appendix 4. As the degree of detail in reporting the level of investment in people and facilities / flocks varies across timeframes, comparisons between plans can be problematic. However, the survey and anecdotal information indicate that[3]:

– Investment into wool RD&E across all jurisdictions is probably similar (or possibly reduced) in 2015 compared to 2011, in real terms.

– The number of FTE employed in these areas has almost certainly reduced.

– The demographics of research and extension resources are reported (anecdotally and with some justification from the data) as skewed towards 'closer to retirement than commencement'.

– Most of the reduction in resources between 2011 and 2015 has been in publicly-funded extension.

– Available facilities for wool RD&E remain very similar in 2015 compared to 2011, as do the number of flocks.

– The likely retention of all flocks except for one in NSW (Glen Innes) demonstrates ongoing commitment to wool research by Australian institutions.

– With reducing extension personnel being employed within the public sector, there appears to be an increase in private sector consultants available (a list of these consultants was compiled in the preparation of this plan).

– However, the overall reduction in human resources across all RD&E areas has negative consequences for the future capacity and capability within this sector.

3.2 INDUSTRY AND GOVERNMENT RD&E PRIORITIES

A range of strategic and operational plans with relevance to the wool industry exist across various industry organisations and agencies. An analysis of these plans has been undertaken to assess consistency across plans, especially in relation to how they align with the Commonwealth's Rural Research and Development Priorities, as well as with the existing Wool Industry National RD&E Strategy. A snapshot of the comparison of relevant wool industry (and associated) plans is provided below in Table 1.

A range of other documents were also reviewed but are not included in the table. These include:

– ABARE (2009), *'Promoting productivity in the agriculture and food sector value chain: issues for R&D investment'* ABARE and BRS report for the Rural R&D Council

– AWI (2015), *Presentation to RMCIC Meeting,* June

– NSW DPI (2015), *NSW Wool Industry and Future Opportunities.* A report to the NSW Department of Primary Industries from Miracle Dog, Poimena Analysis, Scott Williams Consulting and DAFWA

– PIRSA (2013), *South Australian Sheep and Wool Industry ScoreCard Overview 2013-14*

– PISC (2010), *National Beef Production RD&E Strategy.* Primary Industries Standing Committee – R&D Sub-Committee, January

– RIRDC (2014), *Assessing the competitiveness of Australian Agriculture – Summary*

– RIRDC & CSIRO (2015), *Rural industry futures - Megatrends impacting Australian agriculture over the coming twenty years.* Stefan Hajkowicz and Sandra Eady

3 Institutions appear to have interpreted the request for information in different ways, so the raw data sometimes appear anomalous. For example, in some cases wool and sheepmeat RD&E have been combined.

– RMCIC (2014), *Sheep and Beef Extension – a vision and framework for future investment. Discussion Paper – Version 2*

– TFGA (2014), *The Tasmanian Red Meat Industry Strategic Plan*

The Universities involved in the wool industry through both on- and off-farm RD&E tend not to have documented strategic priorities. Research groups at Universities are typically formed along discipline lines (genetics, nutrition, health, reproduction, etc) across species.

There are also a range of other national plans with which the wool industry engages, including:

– National Primary Industries Animal Welfare RD&E Framework

– Climate Change Research Strategy for Primary Industries: RD&E Strategy

– (National Primary RD&E Framework) Animal Biosecurity RD&E Strategy

– Australian Wool Industry Emergency Animal Disease Preparedness RD&E Strategy.

The National Rural Research and Development Priorities listed in Table 1 *focus on advanced technology; biosecurity; soil, water and management of natural resources; and the adoption of R&D*[4].

The priorities are:

– Advanced technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture;

– Biosecurity, to improve understanding and evidence of pest and disease pathways to help direct biosecurity resources to their best uses, minimising biosecurity threats and improving market access for primary producers;

– Soil, water and managing natural resources, to manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts; and

– Adoption of R&D, focussing on flexible delivery of extension services that meet primary producers' needs and recognising the growing role of private service delivery.

The Government notes that, while these priorities do not cover all of the important issues facing primary production (and are not designed to be extensive or exclusive), they are the highest priority areas based on stakeholder feedback.

In May 2015, the Federal Government also released a broad set of Science and Research Priorities, and corresponding Practical Research Challenges. These priorities and challenges have been developed to *'increase investment in areas of immediate and critical importance to Australia and its place in the world'*[5] and cover the following topics:

– Food (including fibre);

– Soil and water;

– Transport;

– Cybersecurity;

– Energy;

– Resources;

– Advanced manufacturing;

– Environmental change; and

– Health.

4   http://agriculture.gov.au/ag-farm-food/innovation/priorities
5   http://science.gov.au/scienceGov/ScienceAndResearchPriorities/Pages/default.aspx

TABLE 1: A COMPARISON OF PREVIOUS AND EXISTING WOOL-RELATED RD&E PLANS
ALIGNMENT OF WOOL RELATED RD&E STRATEGIES

STRATEGY / Sub-Strategy	PROGRAM 1: WOOL PRODUCTION				PROGRAM 2: WOOL SUPPLY CHAIN MANAGEMENT AND DEMAND GROWTH			PROGRAM 3: WOOL INDUSTRY RESILIENCE AND GROWTH	
	1.1 Attaining best practice on-farm management for wool production – labour, market specs, parasites, reproduction	1.2 Accelerating genetic gains of merino sheep	1.3 Enhancing welfare of wool producing sheep	1.4 Improving wool harvesting and clip quality	2.1 Innovating product, processing and manufacturing through delivering new products and enhancing efficiency	2.2 Improving supply chain logistics through reducing post-harvest costs and improving selling systems	2.3 Strengthening consumer confidence in woollen products	3.1 Protecting market access through effective biosecurity systems and enhanced product integrity	3.2 Enhancing wool enterprise resilience – climate variability, carbon markets, industry skills
National Wool RD&E Plan 2011-2030	✓	✓	✓	✓	✓	✓	✓	✓	✓
AWI Strategic Plan 2016/17 – 2016/19	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sheepmeat Industry Strategic Plan SISP 2020	✓	✓	✓					✓	✓
Sheep CRC Operational Plan 2015/16	✓	✓	✓						✓
Animal Health Australia Strategic Plan 2015-2020	✓	✓	✓					✓	✓
WA Sheep Industry Strategic Plan 2025+	✓	✓	✓			✓		✓	✓
Victoria Sheep & Beef Industries Investment Plan 2015-2019	✓	✓	✓			✓		✓	✓
NSW Sheet Industries Strategic Direction 2014 to 2019	✓	✓	✓			✓		✓	✓
SA Sheep Industry Blueprint	✓	✓	✓					✓	✓
Charles Sturt University	✓								
National Rural Research & Development Priorities (previous)	Adoption of R&D				Supply chain and markets			Bio-security	Soil, water and natural resou
	Advanced Technology								

3.3 Building environmentally sustainable wool enterprises – pasture productivity and NRM	3.4 Building wool industry strategic thinking – value propositions	OTHER AREAS COVERED BY PLANS
✓	✓	Previous plan
✓	✓	Significant coverage of marketing, business intelligence, coprporate affairs, Woolmark and corporate services
✓	✓	Sheepmeat focus - Marketing and promotion, product (meat) quality and integrity systems, processing and live exports
	✓	Quality-based sheepmeat value chains; estimating carcase values based on lean meat yield and eating quality; yearling Merino and large lamb grading
	✓	WA sheep industry brand, communication and promotion: Industry leadership, skills and capacity
✓	✓	Also covers beef industry
✓	✓	Considerable focus on sheep meat, with strong links to Sheep CRC
✓	✓	Vision is 'increase industry productivity and value by 20% by 2020. Also SA Sheep & Wool Industry Scorecard
		Specialist in mixed farming systems
d managing rces		

Some observations from this comparison are:

– Collectively, the various wool strategic and operational plans fully cover all of the previous Rural R&D Priorities (for a comparison of this new National Wool RD&E plan with the new Government R&D priorities see sections 4.4).

– The strategies and sub-strategies of the National Wool RD&E Strategy 2011-30 are also fully covered by the various wool strategic and operational plans.

– As expected, AWI's Strategic Plan 2016/17 – 2018/19 has the broadest scope of all plans.

– Other plans align well with the AWI Strategic Plan except in the areas of:

- Innovating product, processing and manufacturing through delivering new products and enhancing efficiency, and

- Strengthening consumer confidence in woollen products.

This is to be expected given the low existing capacity in Australia.

– Many associated plans cover all aspects of the sheep industry – that is, both sheepmeat and wool – while others also cover other broadacre pursuits such as beef cattle.

04

STRATEGIC DIRECTION FOR NATIONAL WOOL RD&E

4.1 VISION

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

The objective for the Australian sheep industry is to maintain the gross value of agricultural production (GVAP) of sheep at 2017 levels in real terms through to 2030.

To achieve this vision will require a highly efficient and effective wool RD&E sector, undertaking collaborative investment and capability planning, to develop and deliver technology and systems that improve productivity through R&D and adoption; develop the industry's people; manage industry risks; strengthen the value chain; and support wool's positioning in markets globally.

4.2 NATIONAL WOOL RD&E PROGRAM FRAMEWORK 2018–2022

The following programs have been identified as priorities for wool RD&E investment over the next five years. Programs are articulated at a high level to provide the flexibility to exploit good ideas as they arise, while at the same time making clear the RD&E priorities of the industry.

These programs cover only those areas in which there is cross-organisational investment among the parties to the plan. Areas such as new wool product development, which is the remit of AWI and textile industry partners, are not included in this plan.

PROGRAM 1: INCREASE PRODUCTIVITY

Rationale:

Innovation drives the prosperity of every industry. R&D to deliver new products and processes is critical to ensuring wool remains a competitive textile fibre, and the wool industry is profitable and satisfying for all participants. This program seeks to increase the productivity and hence profitability of wool producers.

Activities:

Priorities for R&D investment over the life of this plan are:

- **Reproductive performance**, especially of the Merino;

- **Survival rates, especially in ewes**, lambs and weaners;

- **Reduced predation of sheep**;

- **Running the right sheep for the enterprise**, achieved largely through breeding decisions;

- **New options for sheep in the cereal zone**; and

- **Greater understanding of breed demographic shifts** and the impacts on wool production and productivity.

Key performance indicators[6]:

Over the life of this plan and to 2030:

1. Average marking rates will increase by 0.5% per annum

2. Average Merino hogget survival rate will increase by 0.13% per annum[7]

3. Average Merino lamb survival rate will increase by 0.2% per annum

4. Average adult sheep survival will increase by 0.1% per annum

5. The proportion of hogget ewes mated will increase by 0.5% per annum (from 10% to 17.5% in 2029-30)

6. The average wool cut per head will be maintained at 4.5 kg (2014-15 base) or will increase

7. These targets will collectively result in a 0.7% p.a. increase in sheep numbers

PROGRAM 2: OPTIMISE ADOPTION

Rationale:

The outcomes of Program 1, and of the R&D conducted over many decades in the wool industry, are of little value unless they are appropriately adopted by industry participants. There are much greater differences in performance between top-performing and average wool enterprises than between different broadacre enterprises. These differences are due to the adoption or non-adoption of practices proven to improve profitability or reduce risk.

Activities:

Projects will be undertaken to enhance the adoption of proven practices guided by sound decision-making. Consistent with the priorities identified in Program 1, practice adoption priorities include (but are not limited to) those that optimise the management of the breeding flock – such as targeted nutrition, use of scanning, individual animal management and the application of the most current quantitative genetic and genomic data and tools.

Key performance indicators:

By 2022:

1. 25% of Merino ewes will be managed using the recommendations of Lifetime Ewe Management[8]

2. The number of Merino ewes that are scanned for litter status and differentially managed to aid reproductive performance will increase from 25% to 34%[9]

3. 50% of Merino producers will be using genetic tools (e.g. Australian Sheep Breeding Values, Merino Superior Sires, wether trial data) in ram purchase decisions[10]

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6 These KPIs have been based on a combination of information taken from Young, J. (2016) "Meta-Target Outcomes for the AWI Reproduction Strategic Plan" and Thompson AN, Trompf J, Young JM (2016). Reproduction Strategic Plan. AWI Internal document, along with assumptions within the modelling work of Curtis, K (Unpublished)
7 Current survival rates are: Merino hogget 94%; Merino lamb 92%; and adult 96%
8 Thompson, A (2016) pers. communication
9 Thompson, A (2016) pers. communication: Assumes that in 2016, 32% of Merino ewes are scanned for multiples, and around 80% of those differentially managed = 25.6 of ewes differentially managed. Assumes target increase to 33-35% (which would mean an 8% increase in total % ewes scanned for multiples and a 5% increase in the % of those differentially managed)
10 Combination of opinions and data from AWI, NSW DPI, DAFWA and the Sheep CRC

PROGRAM 3: BUILD CAPACITY AND CONFIDENCE

Rationale:

Farming is an increasingly complex business demanding multiple skills, many of which have not traditionally been associated with agriculture, such as business planning, procurement and price risk management. The success of the wool industry relies heavily upon its participants having the capacity and confidence to build profitable and sustainable enterprises. This strategy is closely aligned with and an enabler of Program 2.

The future success of the industry also relies on the ongoing availability of skilled researchers and extension/training experts, especially given the aging profile of current resources.

Activities:

Investments will be made in activities that build skills in **business management, risk management and resilience, workplace (physical and mental) health and safety, succession planning, leadership** and related areas. A key area of investment will be **labour savings and efficiency**, included here rather than in Program 1 because it can reduce stress and aversion to sheep as an enterprise.

Key performance indicators:

By 2022:

1. As a result of capacity building programs, producer confidence in the sheep industry will increase

2. New labour-saving technologies will be available for use by producers

PROGRAM 4: MANAGE RISKS, EXPLOIT OPPORTUNITIES

Rationale:

The wool industry faces a number of serious risks to its capacity to operate, its domestic social licence and its consumer acceptance. Such risks include:

– Changing climate, droughts, floods etc.;

– Pests and weeds;

– Emergency animal diseases;

– Consumer responses to animal welfare and management

Collective action is important to manage these risks as effectively as possible. With an effective approach, some risks become opportunities – for example, wool production can be a key risk management tool for landholders in conjunction with cropping as climate variability increases.

Activities:

Activities under this strategy seek to reduce the chance of occurrence, or mitigate any impacts that do eventuate, in relation to key industry risks. Priorities for industry-level risk management are in the areas of **animal welfare, climate change and variability**, and **emergency and endemic animal disease**.

Key performance indicators:

By 2022:

1. Australian producers have the tools and know-how to enable compliance with relevant domestic and international guidelines for sheep health and welfare

2. 80% of producers have the knowledge and skills to better manage the effects of climate variability

3. Investments in biosecurity research and diagnostic capacity are maintained at a level sufficient to allow industry to respond as required under the Emergency Animal Disease Response Plan

PROGRAM 5: STRENGTHEN THE VALUE CHAIN

Rationale:

Developments in information and communication technology offer opportunities to greatly improve the flow of products and data throughout the value chain. Greater exchange of data between industry participants will deliver efficiency in product description and feedback as well as traceability, important for Program 4.

Activities:

The strategy will involve investments in areas such as **wool harvesting, wool sampling and testing, classing, bale identification and wool selling systems**.

Key performance indicators:

By 2022:

1. The costs associated with testing and the management of wool selling systems has been maintained at or reduced from 2015 levels

2. The relative cost of wool harvesting (average c/kg) has been reduced from the 2015 benchmark

3. At least 90% of all wool sold is covered by the National Wool Declaration (NWD)

PROGRAM 6: SUPPORT WOOL'S MARKET POSITIONING

Rationale:

Wool is a premium product occupying a small niche of the textile market. Like any differentiated product, its success relies on strong positioning underpinned by credible evidence to support that positioning. AWI's marketing campaigns and those of many downstream players seek to emphasise the many qualities of wool. There is an important role for R&D to support these market propositions.

Activities:

Activities under this strategy will be focused on wool's key competitive strengths, including its **naturalness, ecological credentials, health benefits** (sleep, skin health) and **functional benefits** (next-to-skin comfort, active cooling etc).

Key performance indicators:

By 2022:

1. Improve wool's environmental footprint rating

2. Evidence of and specifications for:

   - wool next to skin garments to ameliorate chronic skin condition

   - wool bedding and sleepwear improves sleep

   - safety benefits of wool

4.3 ALIGNMENT WITH SHEEPMEAT INDUSTRY RD&E

The National Wool RD&E Strategy has been developed with close attention to the Sheepmeat Industry Strategic Plan 2015-2030 (SISP) in order to maximise alignment, and minimise duplication, between the two streams of RD&E.

Table 2 maps the National Wool RD&E Programs to the corresponding elements of the SISP.

TABLE 2: COMPARISON OF NATIONAL WOOL RD&E PROGRAMS AND THE SISP.

WOOL RD&E STRATEGY	SISP	COMMON OPPORTUNITIES
Program 1: Increase productivity	Theme 1: Wellbeing of the animals within our care – Imperative 2: Minimising the impacts of endemic animal disease Theme 8: Production efficiency in farms and in intensive finishing systems – Imperative 2: Increasing livestock productivity through new research	R&D, especially in: – Reproductive performance – Genetics – Animal health and welfare – Feed base and grazing management
Program 2: Optimise adoption	Theme 8: Production efficiency in farms and in intensive finishing systems – Imperative 1: Systems support to improve the farm business	Adoption resources and delivery vehicles – recognising the 'one sheep' industry
Program 3: Build capacity and confidence	Theme 11: Capability and capacity for the industry's future	Skills (including leadership) development – resources and delivery vehicles
Program 4: Manage risks, exploit opportunities	Theme 1: Wellbeing of the animals within our care – Imperative 1: Continuous improvement of sheep health and wellbeing and Imperative 2: Minimising risk and impact of emergency disease on the sheep industry Theme 2: Stewardship of our environmental resources	RD&E and associated activities (such as QA programs) addressing: – Animal welfare – Biosecurity – Environmental management
Program 5: Strengthen the value chain	Theme 7: Guaranteeing product and systems integrity	Improvement of systems to track sheep and products, and facilitate flows of useful data such as disease prevalence
Program 6: Support wool's market positioning	Theme 1: Wellbeing of the animals within our care – Imperative 1: Continuous improvement of sheep health and wellbeing and Imperative 2: Minimising risk and impact of emergency disease on the sheep industry Theme 2: Stewardship of our environmental resources	RD&E and associated activities (such as QA programs) addressing: – Animal welfare – Environmental management

4.4 ALIGNMENT WITH NATIONAL RURAL RD&E PRIORITIES

The National Wool RD&E Strategy has also been developed with close attention to the Federal Government's Rural R&D Priorities. These are mapped against the National Wool RD&E Programs in Table 3.

TABLE 3: COMPARISON OF NATIONAL WOOL RD&E PROGRAMS AND THE GOVERNMENT'S RURAL R&D PRIORITIES.

WOOL RD&E STRATEGY	RURAL R&D PRIORITIES	COMMON OPPORTUNITIES
Program 1: Increase productivity	Advanced technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture	R&D, especially in: – Reproductive performance – Genetics – Animal health and welfare – Feed base and grazing management – Precision agriculture
Program 2: Optimise adoption	Adoption of R&D, focussing on flexible delivery of extension services that meet primary producers needs and recognising the growing role of private service delivery	Directly related and identified as a key priority
Program 3: Build capacity and confidence	Advanced technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture	A combination of skills development but also labour saving technologies, listed here as well as within Program 1
Program 4: Manage risks, exploit opportunities	Biosecurity, to improve understanding and evidence of pest and disease pathways to help direct biosecurity resources to their best uses, minimising biosecurity threats and improving market access for primary producers Also: Soil, water and managing natural resources, to manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts	RD&E and associated activities addressing: – Biosecurity – Climate variability – Natural resources – Market access

TABLE 3: COMPARISON OF NATIONAL WOOL RD&E PROGRAMS AND THE GOVERNMENT'S RURAL R&D PRIORITIES. (CONTINUED)

WOOL RD&E STRATEGY	RURAL R&D PRIORITIES	COMMON OPPORTUNITIES
Program 5: Strengthen the value chain	Advanced technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture	Improvement of systems to track sheep and products, and facilitate flows of useful data such as disease prevalence
Program 6: Support wool's market positioning	Advanced technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture	New product development will involve innovation of products and processes

05

PLAN GOVERNANCE

5.1 GUIDING PRINCIPLES

The guiding principles for the implementation of this Strategy, especially co-investment in projects, are as follows:

1. Participation in this Plan represents a genuine commitment by each party to contribute actual and appropriate resources to joint projects.

2. The autonomous governance arrangements of wool industry RD&E participants will not be superseded by any overarching collaborative governance arrangement.

3. Contributing parties to the agreement will fund their participation in consultation and collaboration processes.

4. Parties will choose whether and how much to co-invest in projects on a case-by-case basis depending on their specific priorities and reflecting their relative public/private responsibilities.

5. Staff time and other non-cash resources will be appropriately valued and respected by all parties.

6. Every potential project will need to have its value to woolgrowers clearly articulated, a clear path to market and a monitoring and evaluation component built into it from inception.

7. Every effort will be made to ensure that projects do not crowd out the private sector participation and investment.

8. The Wool RD&E Program Framework will not duplicate cross-sector strategy investments, such as those that occur under the National Primary Industries Animal Welfare or Biosecurity RD&E Strategies.

9. Wool RD&E will be complimentary and aligned as closely as possible with sheepmeat RD&E, as set out in the SISP, to minimise duplication and maximise the benefits delivered to sheep producers.

5.2 OVERSIGHT

A significant difference between this Strategy and its 2011 predecessor has been the need to work towards improved collaboration in the current Strategy. To assist this, the Strategy will be overseen by a Committee comprising a selected group of woolgrowers plus representatives of:

– Wool Producers Australia (WPA);

– Federation of Australian Wool Organisations (FAWO);

– State agencies;

– State Sheep Industry Councils, where applicable;

– Universities;

– CSIRO;

– Australian Wool Exchange (AWEX);

– Australian Wool Testing Authority (AWTA);

– Meat & Livestock Australia (MLA); and

– AWI.

The Committee will meet three or four times per year at times providing appropriate alignment with the AWI and MLA planning and project call processes. The Chair of the Committee and hosting of meetings will be rotated among members by mutual agreement. AWI will resource a Committee secretariat to assist with meeting organisation, including the distribution of papers and preparation of minutes.

The terms of reference for this Committee will be determined by the Committee but should include:

– Developing a detailed implementation plan for the new national RD&E strategy, including agreements between parties for capability and management arrangements and information sharing, including IP;

– Establishing consultation arrangements with stakeholders (including Agriculture Senior Officials' Committee (AGSOC) agencies, Universities, RDCs etc.) and preparing a communication plan; and

– Establishing timeframes and responsibilities for all parties, including monitoring, reporting and review (see below).

5.3 ROLE OF MAJOR, LINK AND SUPPORT AGENCIES

Under the National Primary Industries Research, Development and Extension (RD&E) Framework, partner agencies play either a **major, support** or **link** role depending on their level of commitment and availability of resources.

These definitions will continue to apply in the 2018-2022 National RD&E Wool Strategy. Each individual government (States, Territories, and Commonwealth) will perform either:

(a) A **major** national leadership role in which wool is a major priority for the relevant government, and the government endeavours to give a high priority to funding research, including infrastructure; or

(b) A **support** role in which it undertakes some research; or

(c) A **link** role in which it may undertake little or no research but access information and resources from other jurisdictions or parties to meet industry needs by supporting industry adoption.

However, whether a state agency's investment is at a major, support or link level will have **no bearing** on the role the agency plays in the oversight committee. An agency's intention as to whether it wishes to invest in wool RD&E at a major, support or link level is an indication to the industry as to the level of general investment across agencies only.

The commitment from agencies to the role they intend to play over the period 2018 to 2022 is shown in Table 4.

Table 3: Role of partner AGSOC agencies in the implementation of this Strategy.

AGENCY	ROLE
DPIRD	Major
NSW DPI	Support
SARDI	Link
QDAF	Link

5.4 MONITORING, EVALUATION AND REPORTING

Objective monitoring, evaluation and reporting (MER) of progress against this Strategy will be a high priority. As far as possible, MER will make use of data sources already available to the parties such as producer surveys, with baseline values established for 2016. The Committee will seek opportunities to undertake MER in conjunction with that of the SISP – for example, monitoring changes in lamb marking rates. The MER framework for the SISP was developed during 2015/16.

06

APPENDICES

APPENDIX 1: PROCESS TO DEVELOP THIS STRATEGY

This plan was prepared under the guidance of an industry steering committee. The steering committee was chaired by Mr Joe Sullivan (NSW DPI) and comprised the following members.

– Paul Swan (AWI)

– Sue Hatcher (NSW DPI)

– Jen Smith (CSIRO)

– Emma Doyle (UNE)

– Lyndon Kubeil (DEDJTR Vic)

– Stephen Lee (SA Sheep Industry Blueprint & Uni Adelaide)

– David Crowe (AWTA)

– Michael Blake (PIRSA)

– Johan Greeff (DPIRD)

– Nicole Sallur (Q DPI)

– Andrew Johnston (WPA)

– Bruce Mullan (DPIRD)

– Joe Keynes (SA Blueprint and WPA)

The Strategy was prepared by Scott Williams of Scott Williams Consulting and Russell Pattinson of Miracle Dog. During the preparation of the Strategy, extensive spreadsheet modelling based on a range of sheep flock assumptions on performance and demographics was expertly prepared by Kimbal Curtis of Livestock Dynamics. This modelling was fundamental to developing the Strategy's key performance indicators (KPIs).

In brief, the process undertaken by the consultancy team was as follows:

– Review and collate all existing wool industry and related RD&E plans and documents.

– Undertake a stocktake of the human and physical resources already being applied to wool RD&E, or with potential to be applied to it if required, by the various providers.

– Undertake a wool industry situational analysis.

– Prepare 'straw man' concepts for an industry workshop.

– Facilitate an industry workshop to develop the skeleton of a revised wool RD&E strategy.

– Convert the concepts from the industry workshop into a draft strategy.

– Utilise the outcomes from the sheep industry model to refine the plan's KPIs.

The need to strengthen the science and rigour behind the KPIs was identified at the draft strategy stage. Livestock Dynamics was contracted to develop a GVP model for the sheep industry (wool and sheepmeat) in Australia. A summary of the key components of the model is as follows:

– The gross value of agricultural production for wool has increased by 3.6% p.a. over the last decade and by 6.8% for sheepmeat

– The wool industry contributes slightly under 50% of Australia's sheep production value

– The model developed by Livestock Dynamics has three key elements:

- Demographics:

    – Number of {ewes, wethers, rams}, {lambs, hoggets, adults}, {Merino, other breed}

    – Projects lambs marked, sheep and lambs slaughtered

    – Closing no. = Opening no. + Lambs marked – Slaughtered – Deaths

    – Closing number becomes opening number for following year

- GVP calculations:

    – Gross value of production (GVP) = GVP sheep meat + GVP wool

    – GVP sheep meat = No. slaughtered x Carcase wt. x Price (lamb and mutton calculated separately and combined)

    – GVP wool = Wool production x Yield x Eastern Market Indicator (EMI)

- Scenario data:

    – Create scenarios by adjusting inputs

    – Productivity adjustments:
      • Reproduction rate (marking rate), Death rates

    – Management adjustments:
      • Slaughter rates, Mix of ewes joined to Merino versus other breed rams, Hogget mating

– The model developed was tested by predicting (hind-casting) ABS GVAP against model GVP for meat+wool for the period 2009-10 to 2014-15

– A range of scenarios were tested:

- Baseline

- 'Steady state' (S1) – no change in sheep demographics, productivity or reproduction

- 'Meat sector responds' (S2) – favourable responses for the meat sector – increases in marking rate for first-cross (+0.5% p.a.) and meat breed (+1.0 p.a.) lambs

- 'Meat and wool respond' (S3) – marking rates for all breeds increases (3a = 0.4%, 3=0.5%, 3b = 0.6%), mortality decreases, more Merino hoggets joined

- 'MISP and SISP' (S6) – applying assumptions and model outputs from the development of the Meat and Sheepmeat Industry Strategic Plans

- 'Disinvest in wool' (S7) – flock remains static, more Merino slaughterings, reduced Merino breeding ewes and fewer mated to Merino rams

– The outputs from these models are shown in the table below. The industry Steering Committee considered that Option 3b was the most realistic (although flock numbers were quite high by 2030).

SCENARIO OUTPUTS FOR 2029-30

SCENARIO	MODELLED BASELINE (2014-15)	STEADY STATE ($1)	MEAT SECTOR RESPONDS ($2)	MEAT & WOOL RESPOND ($3A)	MEAT & WOOL RESPOND ($3)	MEAT & WOOL RESPOND ($3.5)	MEAT & WOOL RESPOND ($3B)	MISP/ SISP ($6)	DISINVEST IN WOOL ($7)
Sheep Opening No. (SON, million head)	72.6	73.4	73.5	82.6	82.9	77	82.4	83	73.4
Wool production p.a. (Mkg greasy)	320	320	306	352	352	323	355	342	247
Lamb slaughter p.a. (million head)	15.6	16.3	17.7	23.0	22.8	22.1	22.8	23.0	22.1
Sheep slaughter p.a. (million head)	7.5	7.4	7.6	6.6	6.8	6.0	6.8	6.8	6.1
GVP wool 2014-15 $s per head; per SON*	$2427M; $33.4	$2,645M; $36.0	$2,552M; $34.7	$2,819M; $34.1	$2,822M; $34.0	$2,659M; $34.5	$2,834M; $34.4	$2,769M; $33.4	$2,106M; $28.7
GVP meat 2014-15 $s per head; per SON*	$2,349M; $32.4	$2,513M; $34.2	$2,687M; $36.5	$3,221M; $39.0	$3,215M; $38.8	$3,060; $39.8	$3,2211M; $39.0	$3,238M; $39.0	$3,072M; $41.9
GVP total 2014-15 $s per head	$4,776M	$5,158M; +8%	$5,240M; +10%	$6,040M; +26%	$6,037M; +26%	$5,718M; +20%	$6,045M; +27%	$6,006M; +26%	$5,178M; +8%
Predicted EMI (2014-15 $s/kg)	$11.69	$12.73	$12.87	$12.35	$12.34	$12.70	$12.31	$12.47	$13.16

APPENDIX 2: SITUATION ANALYSIS

A1.1 GLOBAL AND AUSTRALIAN WOOL INDUSTRY TRENDS

World sheep population starts to recover

World sheep numbers peaked in 1990 at 1,206 million. Numbers then fell in most of the major sheep producing countries (figure 1), with the exception of China and India where sheep numbers are higher than in 1990. The Commonwealth of Independent States (CIS, Russia) has also seen a recovery in sheep numbers over the past 15 years. More recently, the decline in sheep numbers has been arrested mainly due to a strong demand for sheepmeat and interest in dual-purpose sheep producing both meat and wool. World sheep numbers fell to a low of 1,084 million in 2010, and have recovered a little since then to be 1,155 million in 2015.

New Zealand and Uruguay have not seen any stabilisation of sheep numbers where dairying has taken over land previously used for sheep and in particular Merino sheep. Argentina has also seen sheep numbers continue to decline as the result of strong competition from cropping, mainly for soybeans.

Decline in global wool production stabilises

After two decades of decline, global wool production has stabilised over the past seven years at around 1,100-1,150 mkg clean (figure 2). Global wool production peaked at an all-time high of 2,006 mkg clean in the late 1980s in response to record price levels, excellent seasonal conditions in previous years in many countries and market intervention, notably with the Reserve Price Scheme in Australia. World production then fell sharply as demand declined after a perfect storm of the collapse of the Soviet Union, falling

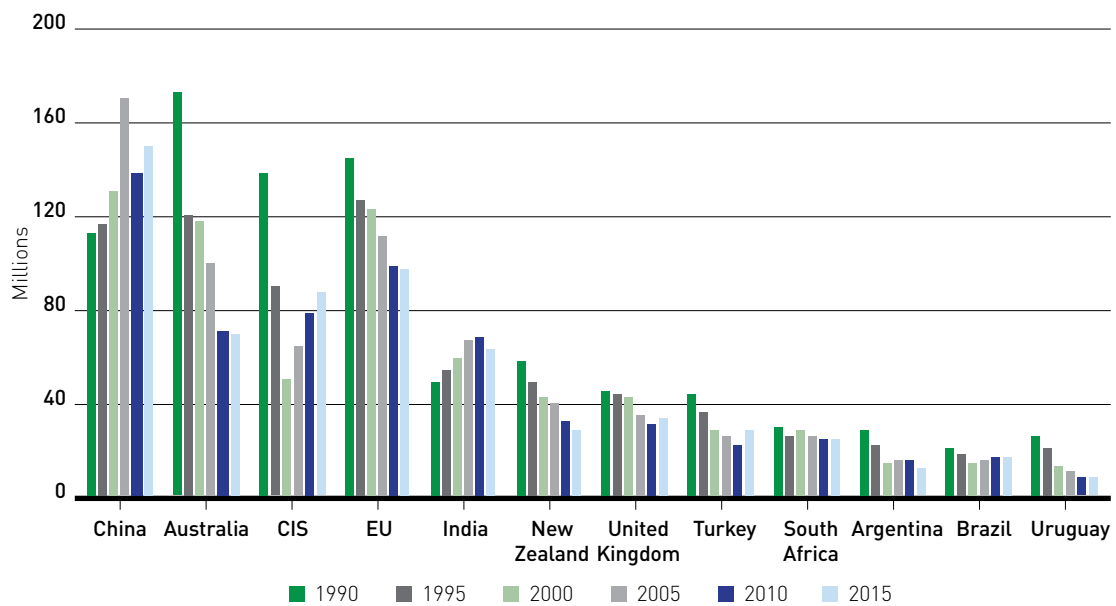## Fig 1: Sheep Population in Selected Countries

Figure A2.1. Sheep population in selected countries, 1990, 1995, 2000, 2005, 2010 and 2015
(*Source:* International Wool Textile Organisation, Market Information 2015)

economic growth in the major advanced economies and the Tiananmen Square incident in China. This caused large stockpiles in Australia, New Zealand and South Africa, and led to a decade of relatively low wool prices. Between 1990 and 2009, world wool production fell by 44% to a low of 1,109 mkg clean as woolgrowers left the industry for other agricultural enterprises, notably cropping and dairying. Since then, world production has stabilised and in 2015 is expected to be 1,160 mkg clean.

The decline in global wool production has been felt mainly in the production of wool typically used in apparel end-uses, rather than in interior textiles end-uses (figure 3). World production of apparel wool is estimated to have fallen from a peak of 1,275 mkg clean in 1990 to a low of 537 mkg clean in 2012. This decline was due to a stronger fall in the prices for apparel wool, notably Merino wool,

in the 1990s and early 2000s and more recently due to the change in focus among sheep producers away from wool-only breeds towards dual purpose and meat breeds. Production of apparel wool has remained at around that low level since 2012. As the figure shows, world production of wool used in interior textiles also declined in the 1990s but has remained at around 600 mkg clean since 2000. Production of interior textile wool exceeds that of apparel wool in 2008 and has remained higher since then. This situation is unlikely to change in the foreseeable future.
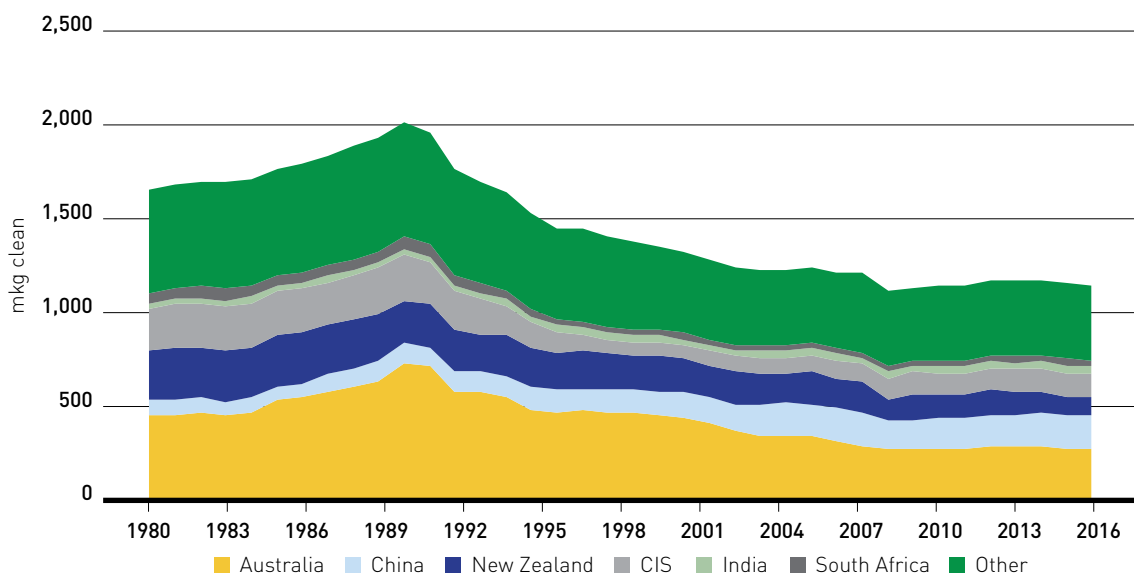
Fig 2: World Wool Production

Figure A2.2. World wool production 1980 to 2016f
(*Source:* International Wool Textile Organisation, Market Information 2015)

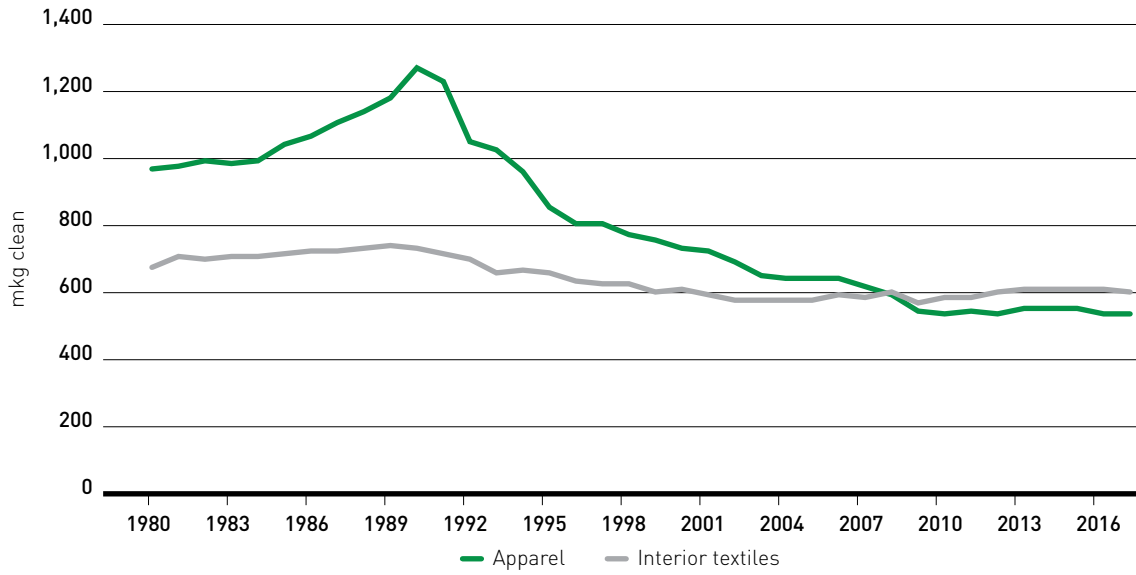## Fig 3: World Production of Wool used in Apparel and Interior Textiles

Figure A2.3. World Wool Production of Wool Used in Apparel and Interior Textiles – 1980 to 2017f
(*Source:* International Wool Textile Organisation, Market Information 2015. Poimena Analysis estimates)
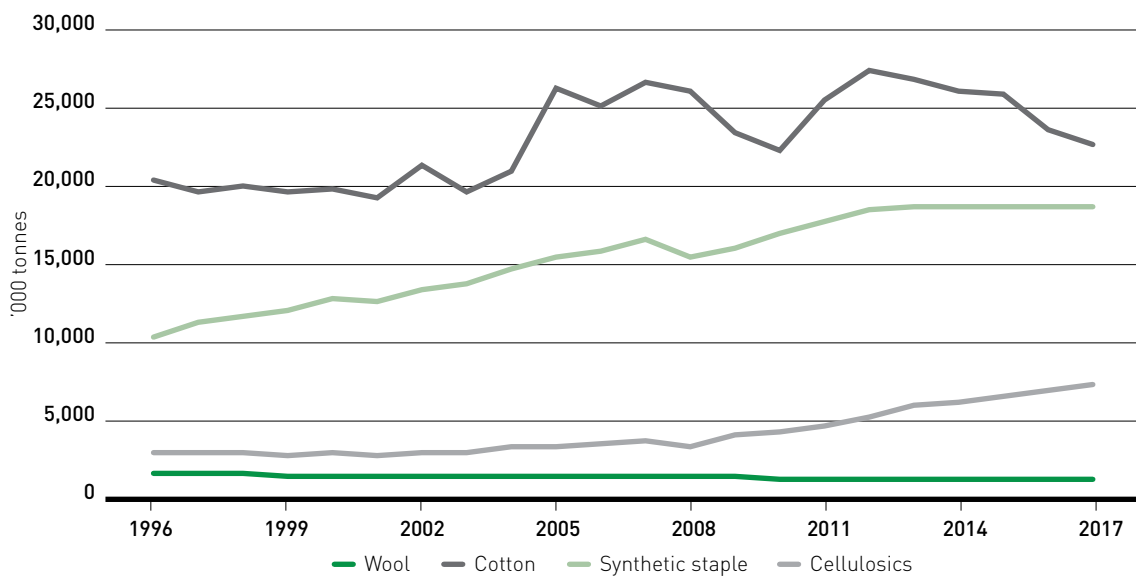
Fig 4: World Production of Competing Fibres

Figure A2.4. World production of main competing fibres 1996 to 2017f
(*Source:* International Wool Textile Organisation, Market Information 2015. CIRFS, USDA)

The volume of the main competing fibres continues to grow

While world wool production and sheep numbers have stabilised in the past five years, world production of other fibres continues to grow, particularly of man-made fibres. As figure 4 shows, world production of synthetic staple fibres (such as polyester staple and acrylic) and of cellulosic fibres has increased strongly in the past two decades. The growth in cellulosic fibres since 2008 has been particularly noticeable. These are the fibres that compete most directly in blends with wool, notably in poly-viscose for suiting fabrics and in acrylic knitwear. World production of cotton has also increased since the mid-1990s, but has pulled back from the peak production year in 2012 in response to an extended period of low prices.

Australian wool production and sheep numbers to remain relatively low

Australian wool production and sheep numbers have followed global trends. Shorn wool production in Australia fell from a record level of 1,029 mkg greasy in the 1989/90 season to 343 mkg greasy in 2009/10 (figure 5). It has remained at around that level since, with year-to year fluctuations due to seasonal conditions. The Australian Wool Production Forecasting Committee predicts that shorn wool production will decline to 332 mkg greasy in 2015/16. Beyond that, ABARES' five year forecasts made in March 2015 suggests that production will recover only slightly by 2019/20 to 345 mkg greasy.

Australian sheep numbers have also fallen from high levels in 1989/90 to around 70-72 million head in recent seasons. Meat and Livestock Australia (MLA) predicts that the sheep flock in Australia will increase from a low of 68.7 million head in 2016 to 71 million head by 2019.

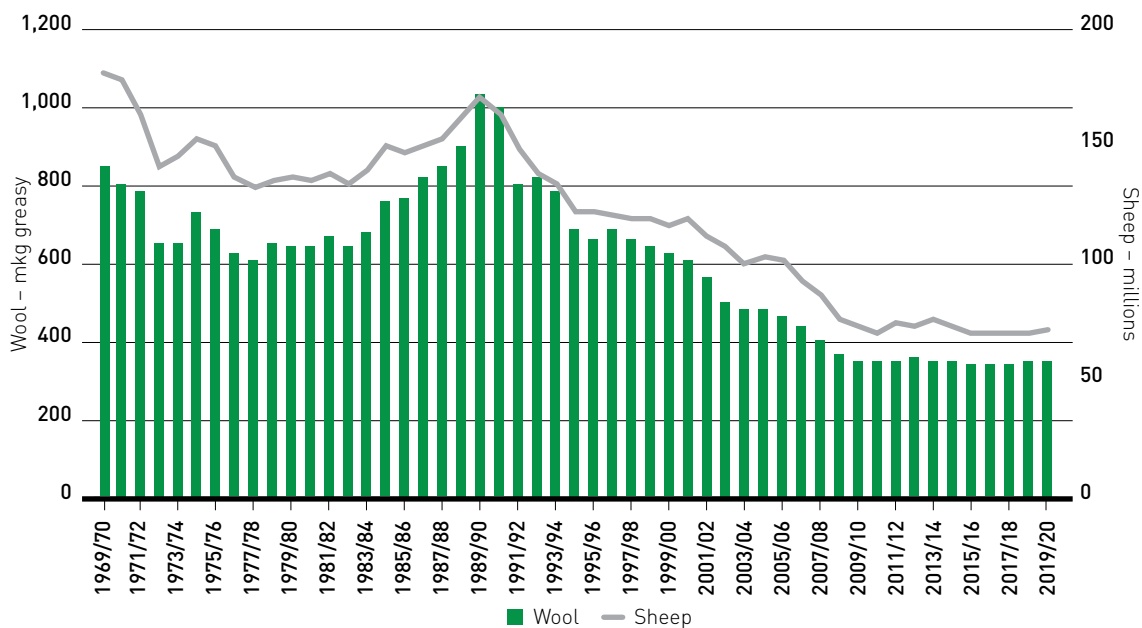## Fig 5: Australian Wool Production and Sheep Numbers

Figure A2.5. Trends in Australian shorn wool production and sheep numbers 1969/70 to 2019/20f
(*Source:* Australian Wool Production Forecasting Committee, Australian Bureau of Statistics, ABARES (for wool production forecast 2016/17 to 2019/20 and MLA (for sheep number forecasts 2015/16 to 2019/20))

In aggregate, IWTO estimates that Australia accounted for 24% of world wool production in 2014/15, down from a share of 36% in 1989/90. Australia's share of apparel wool is higher, at 48% in 2014/15 and its share of wool of 24.5 microns and finer was 66%.

However, opportunities for increased sheep (and wool) do exist from:

– A global increase in demand for protein

– A desire by many farmers to manage climate risk by diversifying their enterprise mix

– Greater focus on dual-purpose animals

One feature of the trends in Australian shorn wool production over the past two decades has been a significant shift towards production of superfine wool (18.5 micron and finer), away from medium Merino wool (21 to 23 micron), and also an increase in production of crossbred and broader wool (figure 6). Australia's production of superfine wool reached a peak of 91.4 mkg greasy in 2013/14. The share of total wool production by superfine wool also reached a record in 2013/14 at 26.8%. The production and share of superfine wool fell slightly in 2014/15 to 89.8 mkg greasy and a share of 25.9%. Australia dominates the world production of superfine wool, with an estimated share of 83%.
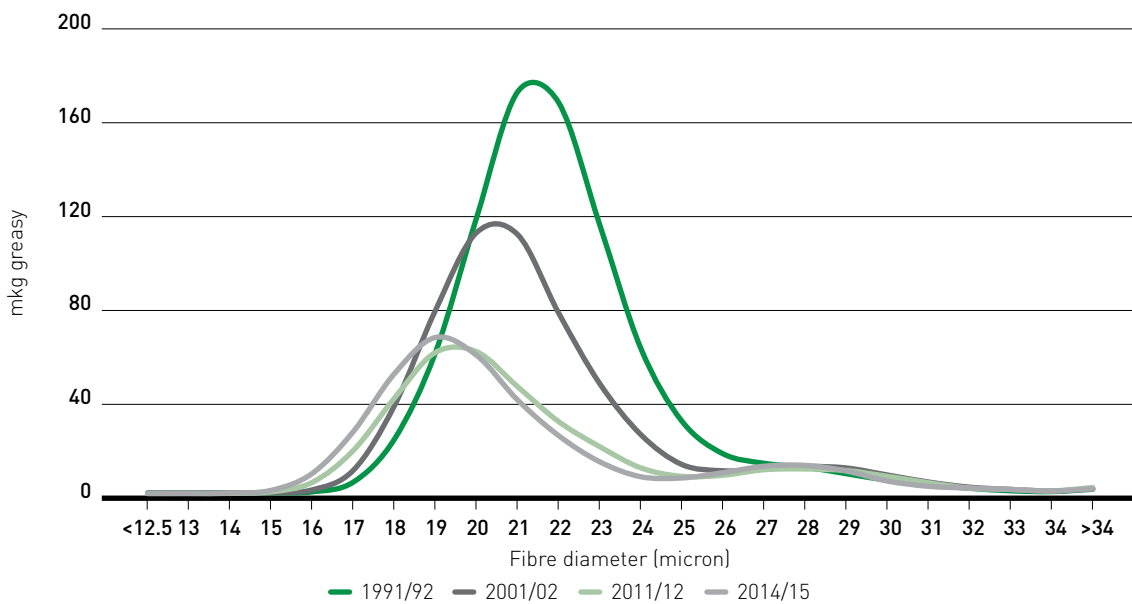
Fig 6: Australian Micron Profile

Figure A2.6. Changes in the Australian micron profile 1991/92; 2001/02; 2011/12 and 2014/15 (*Source:* AWTA Ltd)

Global demand for wool influenced by macro-economic forces

Demand for wool is at the mercy of macro-forces which are outside the control and influence of wool producers. Consumer demand for wool products is influenced by local economic conditions, fashion trends, retail prices and competition from products of other fibres. Wool textile industry demand for wool is influenced by a range of factors including retail orders, labour costs, environmental regulation, relative prices for competing fibres and exchange rates. While no data are available on the level of demand by consumers for products by fibre type, the influence of the macro-economic factors and events can be seen in the trends in wool prices over the past 25 years (figure 7).

Major global economic events, such as the Global Financial Crisis, the subsequent recovery in the US, Europe and Japan, and a surge in cotton prices to record levels (2011) have had a significant influence on the direction of wool prices since the collapse of the Reserve Price Scheme in 1991. The longer-term influence of the significant decline in world wool production can also be seen in terms of the upward trend in nominal wool prices.

As can be seen from this figure, wool prices reached a peak in June 2015, in part due to a recovery in the major advanced economies.
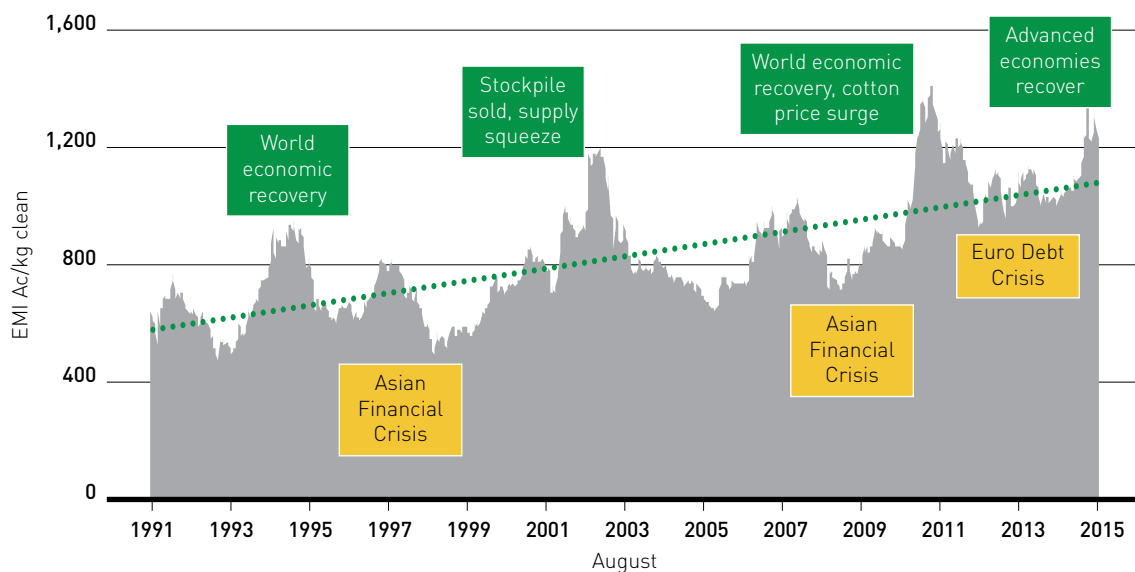
Fig 7: Australian Wool Prices

Figure A2.7. Trends in Australian wool prices (Eastern Market Indicator) 1991 to 2015
(*Source:* AWEX, adjusted for 2014/15 EMI)

Superfine wool price differential has declined due to a strong rise in production

With the significant increase in the production and supply of superfine wool, prices for this wool have not performed as well as prices for medium Merino (20-23 micron) wool. Table A2.1 below shows the micron price differentials relative to 21 micron wool. The current price differential for 18 micron wool is below the 10-year average, although a little higher than the low point seen in July 2014.

This low price differential is interpreted by some people as evidence that demand for superfine wool has not increased, or has even declined. In fact, this low differential is the result of the strong increase in superfine wool production combined with the strong decline in production (and supply given the sale of the stockpile in 2001) of medium Merino wool (20-23 micron).

Fig 7: Micron price differentials

MONTH AND YEAR	18 MICRON	19 MICRON	23 MICRON	26 MICRON	28 MICRON
July 1999	+125%	+88%	-22%	-29%	-29%
July 2001	+194%	+85%	-3%	-19%	-19%
July 2005	+30%	+18%	-3%	-25%	-38%
July 2009	+39%	+22%	-3%	-19%	-38%
July 2014	+4%	+1%	+0.2%	-28%	-41%
September 2015	+11%	+6%	-1%	-13%	-28%
10-year average	**+30%**	**+16%**	**-5%**	**-32%**	**-46%**

Table A2.1. Micron price differentials (% relative to 21 micron wool)
(*Source:* NSW Department of Primary Industries 'NSW Wool Industry and Future Opportunities', updated for September 2015)

Wool's relative price less important than it was

One factor which has had an influence on the demand for wool and on wool prices in the past is the relative prices for competing fibres, notably cotton and synthetic fibres. However, the impact of the relative price of these competing fibres appears to have waned, with the average level of the price ratio in the past five years being well above the average level during the period 2000-2010 which in turn was higher than the average level in 1991-1999 (figure 8). Historically, the wool to cotton and wool to synthetic fibre price ratio

was considered to be 3:1 (1990s) while more recently (2010s) it sits around 5:1. This steady rise in the average level of wool's price ratio against other fibres is due to the decline in wool production combined with the steady increase in production of other fibres. Wool cannot compete in volumes but must compete in product quality and fibre attributes.
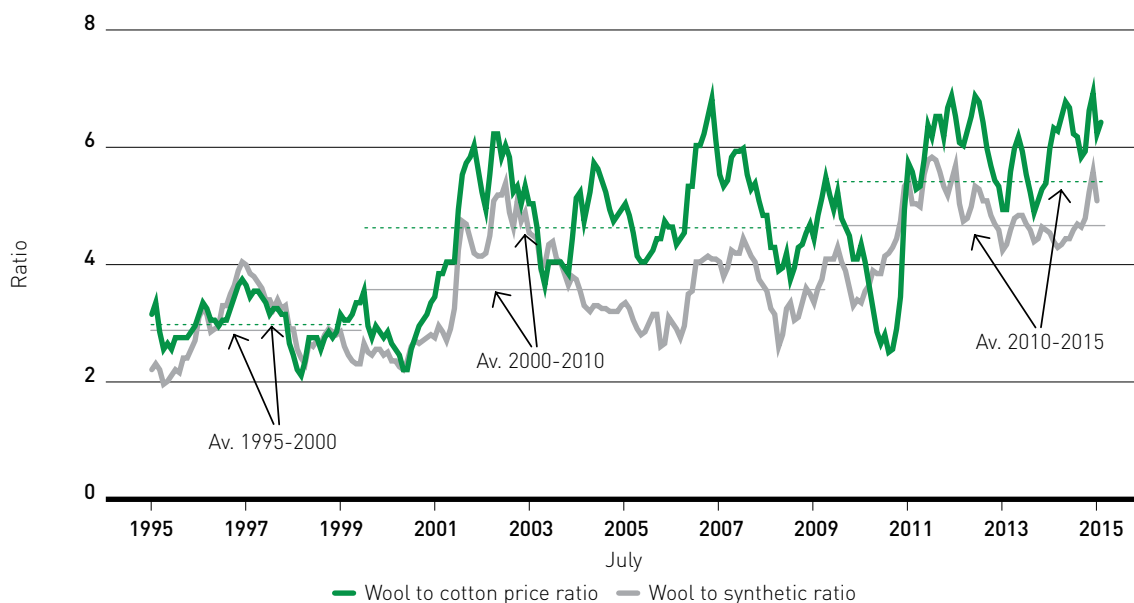
Fig 8: Wool's Price Competitiveness

Figure A2.3. World Wool Production of Wool Used in Apparel and Interior Textiles – 1980 to 2017f
(*Source:* International Wool Textile Organisation, Market Information 2015. Poimena Analysis estimates)

Economic growth the driver of demand for wool

With the relative price of other fibres taking a back seat, economic growth and consumer incomes in the major wool consuming countries is now the key driver of the demand for wool. The eight major wool consuming countries at retail are: China, the United States of America, Japan, Italy, Germany, South Korea, the United Kingdom and France. Collectively these countries account for 65% of world consumption of apparel wool (source: International Wool Textile Organisation). Economic growth in these countries, and the impact this has on consumer confidence and willingness to spend, as well as actual retail sales, has a major influence on the underlying demand for wool from year-to-year, which combines with other factors to push the short- and medium-term trends in wool prices.

An example of this can be seen in the development of prices in the 2014/15 season. After a difficult first half of the season (July to December) as a result of weak and volatile economic conditions in the

Euro-zone, improved economic growth rates in the US and in the Euro-zone in the first half of 2015 helped lift activity levels in the major processing countries, notably in China. This was aided by a strong demand for wool to be used in double-faced woollen coats for women in China (a fashion trend), as well as a sharp appreciation of the US$ against most currencies, including the A$. An additional factor was that the Chinese industry had cut back raw wool purchases in 2014 and ran-down stocks which needed to be replenished. As a result of this combination of factors, wool prices in A$ terms rose to the highest level since April 2011 and the second highest level since the collapse of the Reserve Price Scheme in 1991.

In the longer-run, there is a strong relationship between the per capita consumption of wool and the per capita income levels in each of the major wool consuming countries (figure 9). This figure suggests that there are growth opportunities in China, India, Turkey and Russia.

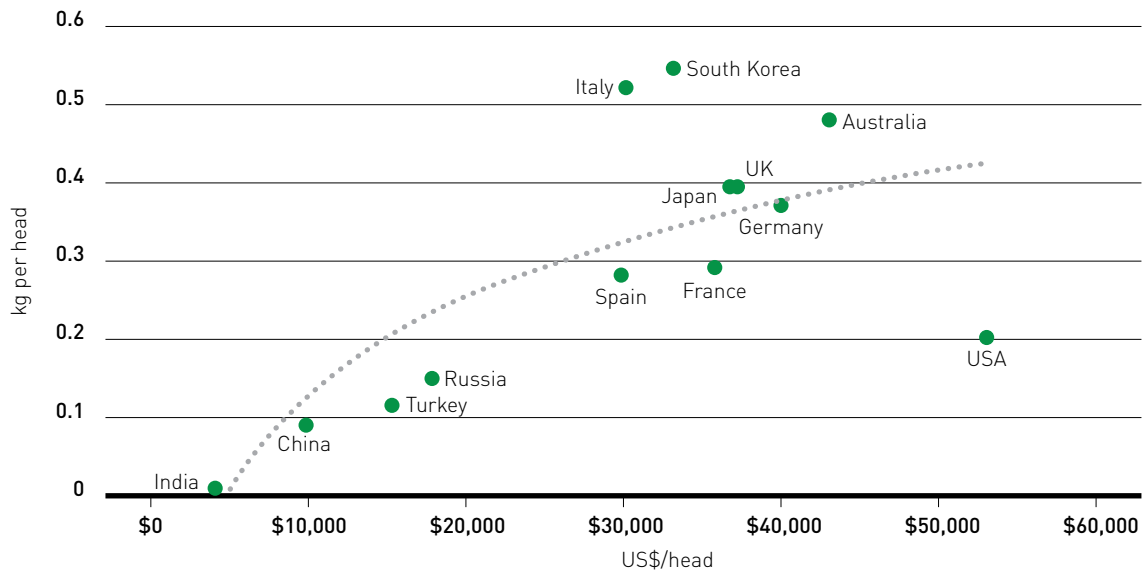### Fig 9: Incomes vs Wool Consumption

Figure A2.9. Relationship between per capita incomes and wool consumption per head
(*Source:* International Wool Textile Organisation, Poimena Analysis)

Consumer requirements for wool

These opportunities, as well as sustained consumption in the major advanced economies, will be aided by marketing and promotion of wool to consumers. This will be needed to highlight the value attributes of wool products targeted at their key requirements. According to the "NSW Wool Industry and Future Opportunities" report from the NSW Department of Primary Industries:

– Quality garments and luxury garments at appropriate price points will continue to be demanded.

– There is demand for products seen as being environmentally sustainable.

– Business wear (suits and separates) for men will continue to be a mainstay for apparel wool demand (around 90% Australian wool is used in apparel).

– Increased urbanisation in China and India may bring growth for men's business wear (including suiting fabrics used in suits, jackets and trousers) but this is no certainty.

– Active leisurewear (next-to-skin wear) and casual garments (knitwear and unstructured trousers), already an important market segment, will be a major growth segment for wool. For knitwear, circular knits will become increasingly important although products from flat-bed knitting will remain a large sector. This sector will favour demand for superfine wool.

– In women's wear, overcoats for colder weather will be the main segment. Broader wool and shorter wool is used in these products.

The increased demand for next-to-skin wear and quality or even luxury garments has seen the demand for fine and superfine wool grow over the past 25 years. This is demonstrated by the trends in the value of Australian wool exports by micron category (figure 10). As this shows, there has been a strong growth in the export value of fine and superfine wool. In part, this is due to the strong increase in production. However, if demand for this wool had not increased, prices would have fallen such that the total value of exports would have remained flat. Even so, the growth in demand has been insufficient to offset the strong rise in production of superfine wool, resulting in a low price differential for superfine wool over 20-23 micron wool.

In contrast to the growth in export value of superfine/fine wool, the value of exports of 20-23 micron wool has declined. The increase in prices for this wool has not fully offset the large decline in volumes.
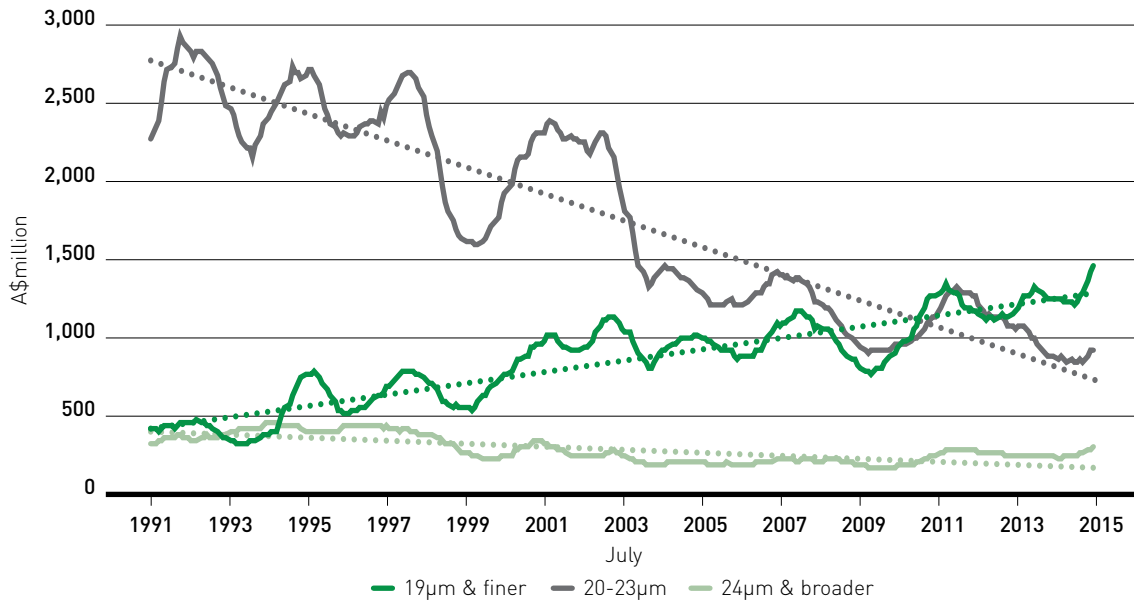
Fig 10: Value of Australian Wool Exports

Figure A2.10. Trends in the value of Australian wool exports by micron category
(*Source:* Australian Bureau of Statistics, Poimena Analysis)

A1.2 WOOL HARVESTING AND SELLING

According to the Wool Selling Systems Review Panel Discussion Paper[11], the cost of harvesting wool from the sheep's back to delivery to the 'mill door' in 2013/14 was around $2.63/kg greasy. This is 12% higher than the level in the four years since 2009/10, an average annual compound increase of 2.7% per year.

Shearing costs remain the most significant cost for growers in delivering their wool from the sheep's back to the mill. These costs amounted to $1.68/kg greasy in 2013/14, or 64% of the total sheep's back to mill door/ship's rail cost. This in-shed cost compares with the average auction price in 2013/14 of $6.77/kg greasy. In other words, shearing costs accounted for around one quarter of the average price received at auction.

The total selling costs (i.e. between shearing shed door and ship's rail) in 2013/14 amounted to $0.95/kg greasy or $167/bale. These costs include transport, warehousing, testing charges, insurance, selling and buying commissions, show floor costs, AWEX fees, the AWI Wool Levy and finance costs. Total wool harvesting and selling costs amounted to 38% of the average price received at auction. The AWI-initiated Wool Selling Systems Review is currently investigating the wool selling system and will make recommendations in the last quarter of 2015 in relation to how such arrangements might be improved.

11 www.wool.com/globalassets/start/about-awi/how-we-consult/wool-selling-systems-review/wssr_discussion_paper_060715.pdf
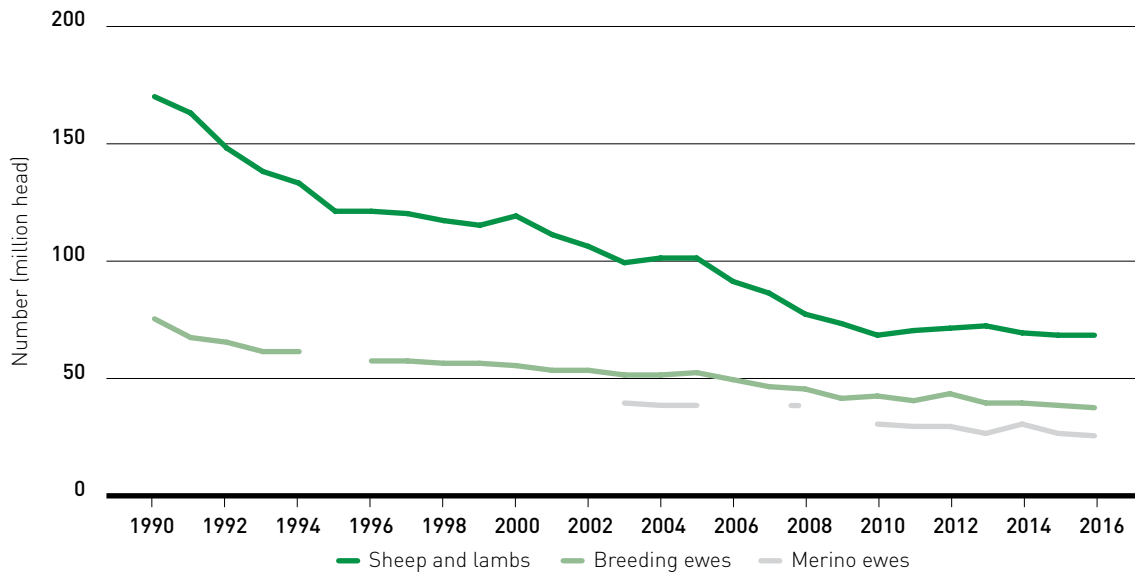
Fig 11: Sheep numbers

Figure A2.11. Number of sheep and lambs (millions), number of breeding ewes and number of Merino breeding ewes (millions) (*Source:* based on ABS data)

A1.3 AUSTRALIAN SHEEP INDUSTRY DEMOGRAPHICS – TWO DECADES IN TRANSITION

Steady erosion of sheep number and wool production

Between 1990 and 2010, the Australian sheep population declined from 170 million to 68 million sheep and lambs (ABS 71210; ABS 71240; ABS 71110), an overall decline of 60% (figure 11). Over the same period, the total number of breeding ewes declined from 75 million (1990) to 42 million (2014), a decline of 44% (figure 11). Between 2010 and 2016, the number of sheep and lambs has remained relatively steady at around 68 million while the number of breeding ewes has contracted to 37 million[12].

12 From 2011 onwards the ABS has changed the scope for agricultural commodity collections. The Estimated Value of Agricultural Operations (EVAO) has changed from $5000 to $40 000 thus changing the number of farms reporting sheep.
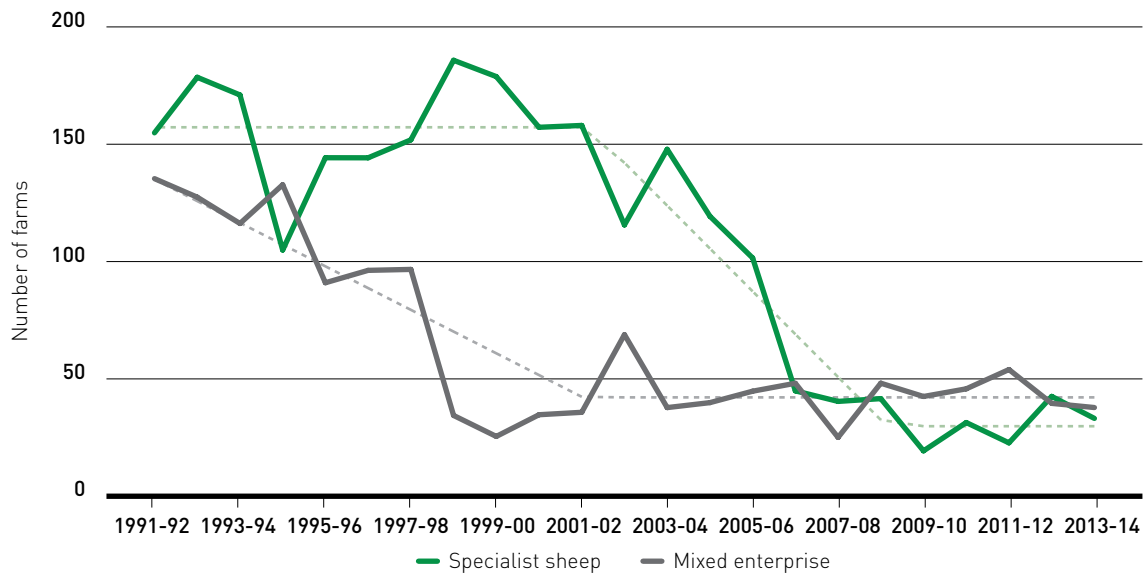
Fig 12: Sheep produce numbers

Figure A2.12. Number of specialist sheep producers and mixed enterprise sheep producers
(*Source:* based on ABARES data)

For the most recent results (30th June 2016), Merino ewes account for 68% of all breeding ewes. In the 2015-16 financial year, 32.7 million ewes were mated (run with rams), 47% to produce Merino lambs.

With respect to the number of sheep farms and their enterprise mix[13], the post-Reserve Price Scheme period falls into three stages (figure12):

– Between 1991-92 to 2001-02, the number of specialist sheep producers decreased by 40% as they either diversified or sold up, while the number of mixed enterprise sheep producers ended the period level with the initial count at just under 26,000;

– From ~2000-01 onwards, the number of specialist sheep producers remained almost unchanged at ~14,200; and

– Between 2001-02 and 2008-09, the number of mixed enterprise sheep producers declined by 50% to ~13,000 and has remained at that level since. The decline in the number of mixed enterprise sheep producers reflects the trend to increasing farm size to take advantage of economies of scale.

13 Definitions used in ABARES Australian agricultural and grazing industries survey:

Fig 13: Meat sheep numbers
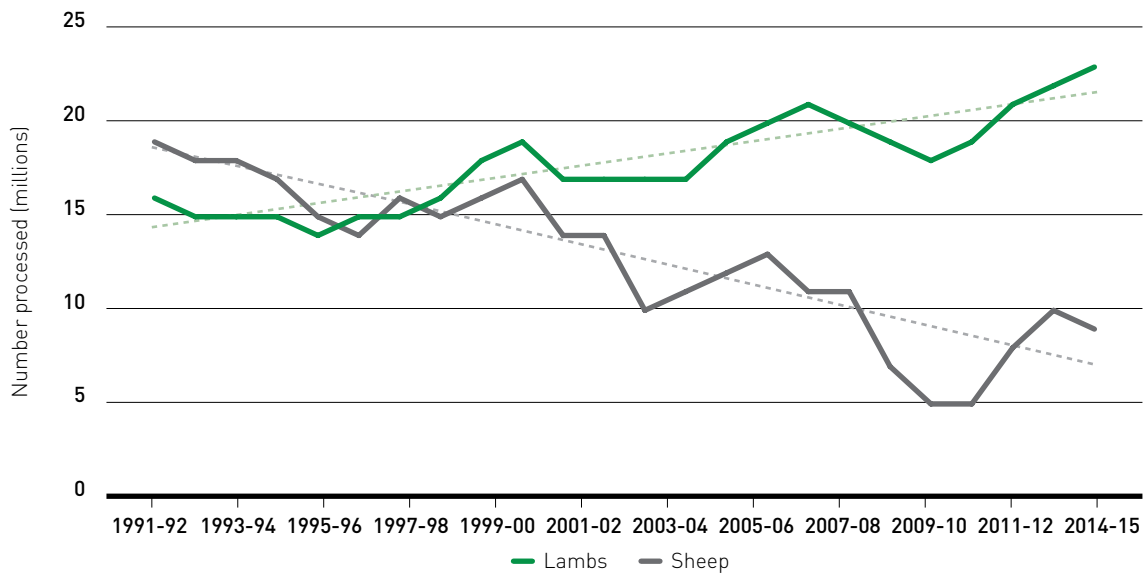
Figure A2.13. Number of sheep and lambs processed for meat in Australia (*Source:* based on ABS data 72180)

Lamb replaces mutton

Since the mid-1990s, the Australian sheep meat industry has changed from processing similar numbers of lambs and sheep toward a focus on quality lamb production. Prior to this shift, sheep turn-off was largely a by-product of the wool industry. This changeover can be seen in figure 13 where lamb slaughter has risen to overtake sheep slaughter from 2000 onwards. Prior to 1999-00, sheep slaughter had averaged 16.5 million head per year including an annual average sell-down of the Australian flock equivalent to 6.2 million per year. Since 2003-04, sheep slaughter has continued to decline and lamb slaughter has risen to 22.9 million in 2014-15. [It should be noted that the ABS slaughter data presented are recorded by state of processing and may not reflect the state of production.]

A **sheep producer** is any broadacre producer with more than 200 head of sheep.
A **specialist sheep producer** is a sheep producer who earns more than 50 per cent of receipts from the sale of sheep, lambs and/or wool.
All sheep producers who do not meet this criterion are classified as non-specialist sheep producers. (i.e. mixed enterprise sheep farms).

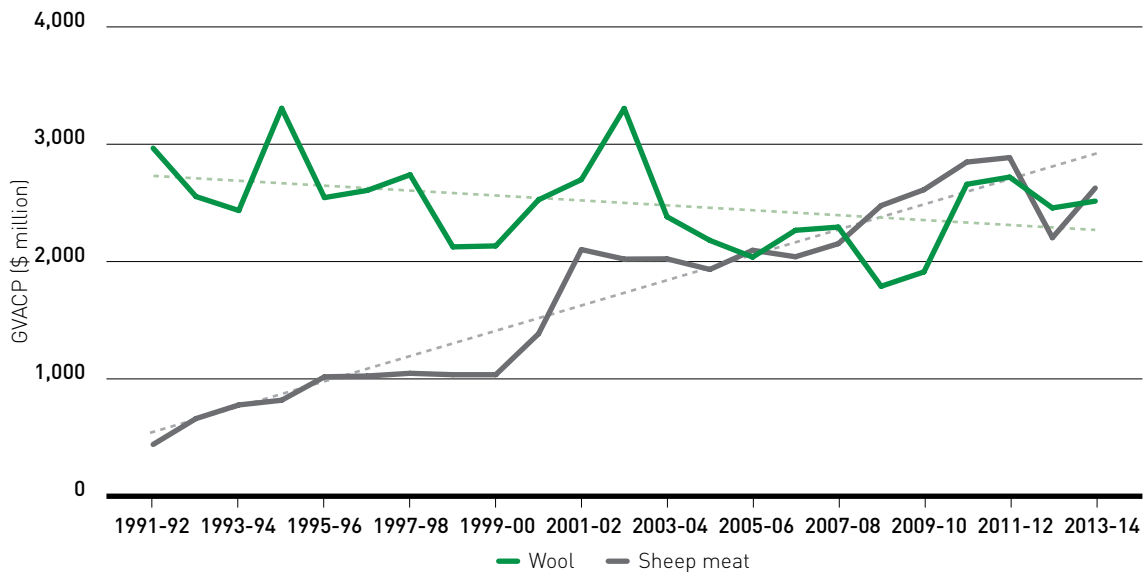## Fig 14: Wool and sheep meat gross value

Figure A2.14. Converging contributions from wool and sheep meat to the gross value of agricultural commodities produced (GVACP). Amounts are in nominal dollars (*Source:* based on ABS data. DAFWA analysis)

Sheep industry transition

Proof of the transition to a dual product industry is best illustrated by the convergence of the gross value of production for wool and sheep meat. Figure 14 shows this convergence in nominal dollars. Prior to 1995, the GVACP from wool was in excess of 3.5 times that from sheep meat. Since 2007-08, the GVACP ratio for wool to sheep meat has averaged less than one.

As at the most recent ABS agricultural census, 2010-11, there were an estimated 73 million sheep and lambs in Australia being run by 43,800 businesses (farms with sheep). Table A2.2 shows the proportion of sheep, breeding ewes, businesses with sheep, and businesses with breeding ewes by farm flock size at 30th June 2011[14]. The 28% of farms with more than 2000 sheep and lambs contributed 73% of the total sheep and lamb population in Australia. Conversely, the 72% of farms with flocks of 2000 or less accounted for just 27% of all sheep and lambs in Australia (Curtis, 2014).

Of the Merino breeding ewes on hand at 30th June 2011, 22.7 million or 75% were on farms with flocks of over 2000 sheep and lambs.

14 The results in the table were for an analysis that covered regions carrying ~99.7% of the sheep and lambs in Australia. Areas excluded are largely urban fringes or northern tropical areas.

Table A2.2. Distribution of sheep, farms, breeding ewes and farms with breeding ewes by farm flock size

| FARM FLOCK SIZE	SHEEP AND LAMBS (MILLIONS)	FARMS (WITH SHEEP AND LAMBS)	BREEDING EWES (ALL BREEDS, MILLIONS)	BREEDING EWES (MERINO, MILLIONS)	FARMS (WITH BREEDING EWES)
Up to 500	2.74	15,400	1.58	0.83	0.83
501 to 1000	5.00	6,800	2.92	1.81	1.81
1001 to 2000	12.02	8,300	6.98	4.79	4.79
2001 to 4000	20.06	7,100	11.57	8.53	8.53
4001 to 8000	18.45	3,400	10.50	7.98	7.98
8001 to 16000	9.89	900	5.58	4.34	4.34
Over 16000	4.71	200	2.56	1.85	1.85
Total	**72.88**	**42,100**	**41.71**	**30.13**	**30.13**

Producers and their age

Data limitations make any detailed analysis of the age distribution of farmers, let alone wool (and sheep) producers, problematic. Barr (2014) states "the quality of industry ABS Population Census data varies between major agricultural industries." The causes of this variation include documented classification changes, undocumented changes in coding practices, issues with farmer definition and the capacity of some farmers to switch industries. Specifically, the sheep industry data are weakened by undocumented coding issues during the 1990s. The cropping and mixed farming industry data are "flawed" because of "undocumented coding changes, inconsistencies in farmer responses to census questions and the capacity of many operators to adjust their businesses in ways that shift them between ABS categories." The cropping and mixed farming category is responsible for a significant proportion of wool production.

Recognising these limitations, the most recent ABS population and agricultural census collections were each conducted in 2011. The 2011 census found a total of 157,000 farmers, a drop of 40% over the three decades, 1981 to 2011 (ABS 4102.0, 2012). Figure 15 compares the 1981 and 2011 age distributions of Australian farmers, by gender. This figure clearly shows the big decline in farmer numbers and that the proportion of farmers under 55 years of age has diminished considerably since 1981.

The median age of farmers in 2011 was 53 years compared to a median age of 40 for people in other occupations. For farmers, this is an increase of nine years in three decades compared with a six-year increase in other occupations. Barr (2014) suggests that due to the rise in the median age of other occupations, much of the rise in the median age of farmers may be due to factors in common with the rest of the country's workforce.

Fig 15: Age profile of Australian farmers – 1981 and 2011
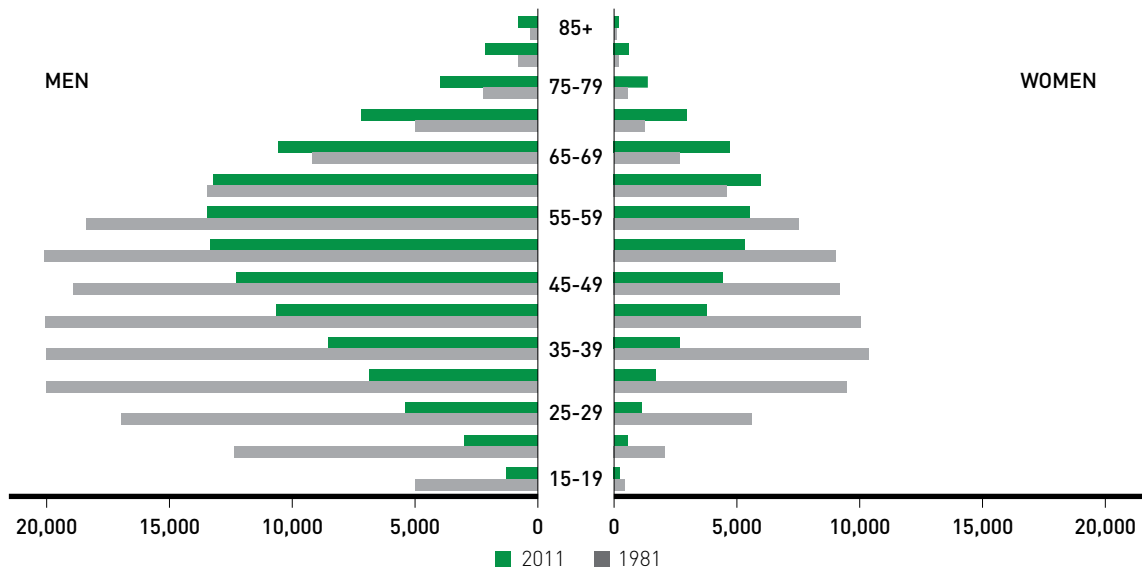
(*Source:* ABS 4102.0, 2012))

Almost a quarter (23%) of farmers were over 65 years old in 2011, compared with just 3% of people in other occupations.

Interestingly, the Australian Farm Institute[15] suggests that the age profile of farmers compared with other occupations can be somewhat misleading, in that:

– The ABS data includes many 'farmers' who run very small enterprises and are 'not strictly farm "businesses" - most relying almost entirely on non-farm income' (e.g. 'tree-changers').

– Farming has a significant 'capital' barrier to entry.

15 Australian Farm Institute (2014) http://www.farminstitute.org.au/_blog/Ag_Forum/post/farmers-are-getting-older-but-its-not-a-problem/

APPENDIX 3: FUTURE WOOL INDUSTRY SCENARIOS

In 2014/15, the NSW Department of Primary Industries received a report from Miracle Dog, Scott Williams Consulting, Poimena Analysis and DAFWA entitled 'NSW Wool Industry and Future Opportunities'. A component of the report included four brief scenarios of what the NSW wool industry may look like in 2025.

At the wool industry workshop held in October 2015 to help develop this national RD&E plan, these scenarios were considered – just as thought starters for 'what might be?"

It should be borne in mind that these scenarios were developed for the NSW wool industry. They are, however, equally applicable to the whole Australian wool industry.

APPENDIX 2 FROM REPORT: NSW WOOL INDUSTRY AND FUTURE OPPORTUNITIES: SOME BRIEF SCENARIOS

Following the development of the situation analysis and consideration of some of the possible implications, the temptation would then be to develop 'a single future' for the NSW wool industry by 2025. However, whatever future was selected it would almost certainly be wrong and would be extremely limiting in creating an environment to generate useful discussion. Instead four short scenarios have been developed which, it is hoped, will elicit some responses (admittedly some scenarios are quite 'challenging', especially for a 10-year period).

Please note that none of these 'scenarios' represent the view of the consultants in relation to the future of the wool industry in NSW. In fact it is highly unlikely that any of the scenarios will eventuate as we have described them. They are provided instead to demonstrate how trends that we can identify today may play out and interact over the next ten years. Our aim is to prompt a response and to create a discussion about what may happen in the industry and what the implications might be for producers, industry and NSW Government.

SCENARIO 1: SHEEPMEAT DOMINATES – 'HOP IN FOR YOUR CHOP'

Situation in 2025

– Meat prices have appreciated rapidly with growing demand from China, other Asian countries and the Middle East in particular

– As a result, there is strong demand domestically for grain and fodder for livestock use. This helps to underpin the price for grains but of course global demand and supply are the key drivers

– In relative terms, wool has not kept pace – it continues to have a market but long-term prices have been only steady, providing reasonable returns to mid-microns but only just covering cost of production for fine wools

Wool industry of 2025?

– The move to meat sheep from wool sheep has continued in the high rainfall zone, and there are fewer Merinos as producers gain the confidence to shift towards more specialist meat breeds

– Producers in the sheep/cereal zone have increased Merino ewe numbers, which offer the flexibility of lamb production using a terminal sire, when seasonal conditions suit, or running dry sheep – and in all situations providing a wool clip

– In both cases, the push for plain-bodied, larger-framed animals continues

– In the pastoral zone, Dorpers and other breeds have increased in popularity and so reduced labour requirements related to wool production

– Across the clip, average fibre diameter has increased and quality (staple strength etc) has declined because wool is essentially a second-order product to meat

Potential implications

– Market data and analysis is critical to give confidence that the global demand for sheepmeat is not simply cyclical but an enduring shift

– There is a need for better genetics to underpin sheepmeat production for both Merinos and meat sheep, and a greater commitment to improving reproductive performance and lamb survival

– Sheep are valuable so there are loud demands to protect them from predation and biosecurity threats

– The importance of export markets for sheepmeat mean that food safety, biosecurity etc are high priorities

– There is a need to better understand the sheep/cropping interface

– Year-round continuous supply of sheep and lambs is an important issue both to meet market requirements and to reduce the seasonality of domestic employment in processing sheep

SCENARIO 2: GLOBAL ECONOMY TAKES OFF – 'GFC OFFICIALLY FINISHED'

Situation in 2025

– The global economy has finally shaken off the effects of the GFC and is growing strongly, notably in China, where growth has moderated on earlier rates but has settled at a still healthy 5-7% pa as it has developed into a more mature economy based on domestic consumption, branded, high-value products and increased demand for services. Traditional wool destinations (e.g. Europe, Japan) are also strong

– Prices for all agricultural commodities are high (grains, sheepmeat, beef) but comparatively, wool is doing especially well, because of constrained supply

– Profitability of Australian agriculture is high, and there is money to invest and to pay down debt, including the capital pouring in from China, the Middle East and elsewhere

– Demand for land and thus land values has increased, not only as a result of the returns offered by agriculture but because wealthy city people are buying country retreats, especially in closer settled areas of high amenity value

Wool industry of 2025?

– Wool production is increasing in the high rainfall zone, where flock structures have gradually been adjusted to retain a higher proportion of wethers in the flock at the expense of lamb production and cattle; breeders have progressively placed more emphasis on increasing wool cut while maintaining or reducing fibre diameter

– In the sheep/cereal zone, producers have increased sheep numbers at the expense of crops, both to reduce the risk associated with cropping and to take advantage of the high wool prices

– There is little change in the pastoral zone where there is less flexibility to increase sheep numbers, although less emphasis is being placed on feral goat capture and more on sheep flock management

– Because producers are making money, levy revenue is high and RD&E is thriving, including investments in long-term research, as is marketing

– Producers are generally happy and motivated so industry structures are stable

Potential implications

– Sheep are valuable so there are loud demands to protect them from predation and biosecurity threats

– Global prosperity means that consumers demand demonstrably high standards of welfare and environmental stewardship

– More knowledge is needed on the sheep/ crop interface

– Inbound investment from China and other countries drives a public debate about foreign ownership, demand for advice from property owners about opportunities for harnessing foreign capital and from investors for management advice

– There is debate about government policy on land use (particularly the locking up of valuable agricultural land for urban or lifestyle stewardship)

SCENARIO 3: CLIMATE VARIABILITY ACCELERATES – 'IT'S JUST NOT LIKE IT USED TO BE'

Situation in 2025

– Changes in climatic conditions have accelerated far more quickly than expected.

– What the science indicated could be evident by 2030 and beyond is fully evident in 2025

– For many of the wool growing regions of Australia, average daily temperature has increased by 1ºC and rainfall reduced by 10% (since 1990 averages)

– Of course there are ripper years and then times of prolonged droughts

– And there are times of far more regular extreme events (floods, fire, heat-waves etc)

– As a result, on average for most regions where sheep are run, there are shorter springs, warmer winters and hotter, drier and longer summers with (in the south) less regular autumn breaks

– The hardest hit areas are the dry margin in the sheep/cereal zone

– Overall pasture production is reduced as are the levels of animal production (meat and wool) as stocking rates have had to be reduced or else land degradation would become common-place (and governments and society were coming down hard on such situations)

– Shorter pasture growing seasons make it more difficult to finish lambs to processing weights on paddock feed. Feeder-finisher systems are adopted on a tactical basis (though under a shadow of strict environmental regulation)

– But it is not all doom and gloom as some colder more elevated areas in NSW (e.g. Orange) are actually seeing improved pasture production as a result of warmer winters, reducing one of the major production limitations

– As a result of climate variability accelerating, government regulation and societal pressure for carbon reduction schemes and environmental stewardship has increased quickly (a Carbon Pollution Reduction Scheme operates)

Wool industry of 2025?

– Generally lower stocking rates as a result of lower pasture production puts a downward pressure on sheep numbers and wool production

– Sheep numbers in HR zone are faring okay as there are less cattle being run

– In the sheep/cereal zone, there are small increases in sheep numbers as cropping (especially at the dry margin) is a very risky business and sheep are more resilient

– Pastoral areas see continued reduction in sheep numbers as the predation and management challenges of the last two decades have continued, including stock water limitations

– Producers face a greater social licence to operate, which is costly

– Wool production overall is about the same as a decade earlier, but there is greater within and between season variability in fibre production and fibre quality

Potential implications

– Need a better understanding of the mixed farming dynamics, and especially the integrated role of animals in cropping enterprises

– Need better understanding of how to deal with extreme events (they can be 'game changers'), heat stress, and climate variability

– Need enhanced medium term climate predictions to provide greater flexibility

– Better risk management tools – for production and price. Possible increase in electronic trading

– Costs of production likely to increase and management adaptations are crucial so greater focus on increasing profitability through better genetics, pasture management, confinement feeding etc

– Climatic changes has increased the focus on biosecurity issues and government support programs

– Carbon farming and ecosystem services are new income streams for farmers

– Need an economical market for lambs that fail to reach processing weight on green feed/stubbles

SCENARIO 4: MARKET CHANGES – 'CASUALISATION CONCERNS'

Situation in 2025

– Over the last decade the move toward greater casualisation in the apparel market continues unabated, as expected

– However, it wasn't expected that emerging Asian markets, especially China, would jump on the casual market band-wagon so quickly at the expense of 'dress-for-success'

– The impact on the men's suiting market (which used to account for about 14% of Australian wool use) has been significant

– To a large extent, menswear has gone down the 'fast fashion' (lower price point, casual styling, rapid design turn-over and 'reasonable' quality) pathway, at the expense of wool and to the benefit of competing fibres

– Blends are still evident but they tend to be low wool content

– High quality pure wool remains the high end fashion in men's suiting and wool is still an important material for knitwear etc.

– Women's wear continues to be a small niche for wool as it has for some time now – further impacted by the fast fashion trend that is now impacting on menswear

– Superfine wool is well suited to the active leisure-wear market and has made significant gains into it, but for reasons of price, product range and colour fashion its move into the active leisurewear market has not been quick or broad enough to avoid an overall drop in demand for finer wools in that 17 to 20 micron range

Wool industry of 2025?

– Demand for wool, especially in the finer end has dropped

– Wool further loses volume and value market share to other fibres and prices reduce

– In the high rainfall zone, the focus turns more toward 'dual purpose sheep' and less on fine wool

– In the sheep/cereal zone, there are less sheep because of overall reduced demand

– The pastoral zone remains at its current low production level because of predation and management capacity (labour requirements for large flocks)

– There is a continuation of the reduction in wool production that was first started back in the early 1990's

Potential implications

– Smaller wool industry as more producers liquidate their flocks

– Greater focus on dual purpose and easy to manage sheep – genetics, pastures etc

– Continued focus on lowering the cost of production

– Less R&D undertaken and adopted

– Human resources previously allocated to wool are moved into other industries (government and private sector)

APPENDIX 4: RESOURCES AVAILABLE FOR WOOL RD&E

A4.1 INVESTMENT

The investment in Australian wool RD&E (on and off-farm) human resources for 2009/10 was estimated to be approximately $11 million[16] or, once an investment multiplier is applied, over $28 million[17]. In 2015 these figures are estimated to be in the vicinity of $33 million). Table A4.1 provides a summary of this breakdown by RD&E institution.

Table A41. Resources invested into wool RD&E by institution (2015)

INSTITUTION	WAGES INVESTMENT	OPERATING INVESTMENT
CSIRO	Not specified	
DPIRD	$10,127,813	
NSW DPI[1]	$4,258,022	$575,920
QDAF	$534,676	$199,272
VicDEDJTR[1]	$12,500,000	
SA (PIRSA, SARDI)	Not specified	
TIA	$1,344,820	$25,000
Sheep CRC	$3,322,637	$1,050,000
AWEX	$1,332,500	$410,000
AWET	$584,318	$309,864
CSU	$320,000	
UNE (includes AWET amount for lecturer)	$826,372	
Deakin University	$71,354	
University of Sydney	Not specified	
University of Melbourne	Not specified	
University of Adelaide	Not specified	
CSIRO		
Totals[1]	**$35,222,511**	**$2,570,056**

1   Wages total covers all sheep - both for wool and sheepmeat work. Wages are adjusted for on-costs and standard multiplication factors

16 Wool Industry, National Research, Development and Extension Strategy (June 2011)
17 There may be a difference in multipliers between plans. In 2010-2015 a 2.6 multiplier was applied. In 2015 the multiplier was investment in staff wages = (salary + 30%) x 2.5. This is based on McCausland I. (2006), 'Report on MLA–DPI audit relating to livestock production research, development and extension' Meat & Livestock Australia.

It should be noted that the figures shown in Table A4.1 were provided by the individual institutions. Some points are noteworthy:

– Few institutions provided data on operating costs.

– Not all institutions were prepared to provide aggregated wages data.

– Not all institutions contacted provided data.

– Some institutions provided data covering 'all sheep' investments (i.e. both sheep meat and wool), such as Victoria.

It is difficult to accurately differentiate activities and apportion investment specific to wool from those of interest to the sheepmeat industry and broad acre agriculture more generally. Accordingly, the absolute figures in table A4.1 should not be taken as precise. Trends compared to the previous planning period are more valuable. In this respect, the current data suggest that the level of investment by RD&E institutions is similar in 2015 to what it was in 2010, especially by DPIRD and DEDJTR (Vic).

A4.2 HUMAN RESOURCES

In 2014/15 there were an estimated 1602 FTEs operating within the sheep and wool industry RD&E. This figure does not include private organisations. The majority of these FTEs were engaged in research.

Table A4.25 provides a breakdown of FTEs by employment classification. By way of comparison, there were a reported 132 FTEs engaged in the wool industry in 2010, however as noted earlier such comparisons are problematic.

Table A4.2. FTEs engaged in wool industry RD&E by employment classification (2015)

EMPLOYMENT CLASSIFICATION	NUMBER FTES CURRENTLY COMMITTED TO WOOL
Research	73.30
Development	8.50
Extension	17.75
Technical	43.60
Lecturing	6.90
Management	10.30
Total	**160.35**

A summary of the resources employed in wool RD&E by institution is provided in Table A4.3.

Table A4.3. FTEs by institution (2015)

INSTITUTION	NAME & DESCRIPTION	FTES
CSIRO	RD&E	36
DPIRD	RD&E, technical	32.65
NSW DPI	RD&E, Management	11.25
QDAF	Extension	2.1
Vic DEDJTR	RD&E, technical	38
PIRSA	RD&E	1.3
TIA	RD&E	3.8
Sheep CRC (note: 7 FTE in-kind)	Research & extension	11.5
Deakin University	Research	0.25
University of Adelaide	Research & lecturing	1.05
University of New England	Research & lecturing (ex AWET)	1.3
University of Sydney	Research & lecturing	16
Charles Sturt University	Lecturing	0.8
University of Melbourne	Research & lecturing	1.3
Australian Wool Education Trust	Lecturing & management	(see UNE)
Marcus Oldham College	Lecturing	0.05
AWEX	RD&E	3
Total		**160.35**

Some observations relating to the data in Table A4.2 and A4.3 and from industry anecdotal evidence are:

– There has been an apparent reduction of resources between 2010 and 2015 in extension.

– DEDJTR Vic (38), CSIRO (36), DPIRD (32), the University of Sydney (16), NSW DPI (11) and Sheep CRC (11.5) employ the vast bulk of available resources (90% of all FTEs).

– In 2010, Universities made up 25% of all FTEs. In 2015, this has dropped back considerably

– The 'skills' of the FTEs (via Australian Standard Research Classification Number) as reported by the main Institutions were:

- w300401 – Animal Breeding;

- 300508 – Parasitology;

- 300203 – Plant Improvement (Selection, Breeding and Genetic Engineering);

- 300403 – Animal Nutrition;

- 300404 – Animal Husbandry (welfare); and

- 309902 – Education and Extension.

– These skills align well with those required by this plan.

A more detailed breakdown of FTEs by institution by age (and some indication of potentially additional resources available) is provided below (Table A4.4.).

Table A4.4. Human resources by Institution (2015)

INSTITUTION	NAME & DESCRIPTION	NUMBER FTE CURRENTLY COMMITTED TO WOOL			TOTAL (INCL. AGE UNSPECIFIED)
		<=40 yo	40-55 yo	>= 55yp	
CSIRO	RD&E, Management	7	24	5	36
DPIRD	RD&E, technical	9.6	12.85	10.2	32.65
NSW DPI	RD&E, Management	2.9	7.05	1.3	11.25
QDAF	Extension	1	1.05	0.05	2.1
Vic DEDJTR	RD&E, technical				38
PIRSA	Extension, mgmt	0.2	0.2	0.9	1.3
SARDI	Research	0	0	0	0
TIA		1.9	0.5	1.4	3.8
Sheep CRC[1]	Research & extension				11.5
Deakin University	Research	0.25			0.25
University of Adelaide	Research & lecturing	0	0.1	0.95	1.05
UNE	Research & lecturing (ex AWET)		0	1.3	1.3
University of Sydney	Research & lecturing	6	6.8	3.2	16
CSU	Lecturing		0.8		0.8
University of Melbourne	Research & lecturing	0.15	0.95	0.2	1.3
Australian Wool Education Trust (UNE)	Lecturing & management				0
Marcus Oldham College	Lecturing				0.05
AWEX	RD&E	0	0.5	2.5	3
Sub-total		**29**	**54.8**	**27**	**160.35**

1 Includes 7 FTE in-kind

A4.3 FACILITIES

In 2010, there were 24 facilities listed as available for wool RD&E. In 2015 this number is largely the same, although there has been some reduction in Queensland.

A listing of the location (by state) of the major facilities either engaged in or available for wool RD&E is shown in Table A4.5. A more detailed listing on these facilities and their capacity is provided in Table 10.

Table A4.5: Facilities available for Wool RD&E (2015)

STATE	NUMBER OF FACILITIES
WA	3
SA	3
NSW	13
Victoria	4
Tasmania	1
Total	24

As noted in 2010, the majority of these sites are not specific for wool or sheep RD&E. In most cases, the facilities, management and overheads are shared between other regional agricultural research, demonstration and extension projects involving other livestock species (cattle, pasture and cropping studies and natural resource management).

A large proportion of RD&E facilities are located in NSW, and often owned/managed by NSW DPI. DPIRD and CSIRO are the other main providers.

All agencies have indicated that their infrastructure will be retained over the next five years demonstrating ongoing commitment to agricultural (and wool) research.

A4.4 FLOCKS

Based on information received thus far, over 70,000 sheep are being run (or could be run) on facilities that could be accessed by the wool industry for RD&E purposes. These facilities are spread over most sheep-growing climatic zones (low rainfall/rangelands, cold/cool temperate, mild/warm temperate and Mediterranean).

The most significant stakes in flocks for wool RD&E are held by University of New England and NSW DPI, and CSIRO. DPIRD, UWA, Victorian DEDJTR and University of Melbourne also hold significant flocks.

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 .

A summary of flocks by state location is shown in Table A4.6.

Table A4.6: Sheep flocks available for wool RD&E (2015)

STATE	NUMBER OF FLOCKS
WA	3
SA	4
NSW	9
Victoria	2
Tasmania	0
Total	18

The likely retention of all flocks except for one in NSW (Glen Innes) demonstrates ongoing commitment to wool research by Australian institutions.

Detailed data and tables are found in Table A4.8.

A4.5 ADOPTION/EXTENSION/ COMMUNICATION RESOURCES

For many decades, adoption/extension services have predominantly been provided by the public sector, which invested heavily in personnel who worked with producers often on a one-on-one basis or through groups. More recently, budgetary constraints faced by government extension agencies, combined with a desire to focus on the provision of services with public benefits (i.e. market failure situations rather than private benefits) have significantly reduced the ability of state agencies to engage provide such services.

Because of this changing environment, there has been a move to increased provision of these services by private commercial organisations, as well as increased collaboration between the public and private sector. Producers have also shown an increased willingness to contribute financially to their own education through group schemes and training programs.

AWI and various state agencies support producer networks, established in each state to spread new ideas and seek the adoption of best practice. A summary of these groups is provided in Table A4.7.

Table A4.7: Summary of AWI- and agency-supported producer networks

GROUP	FOCUS	LOGO
Pastoral Profit	Coaching program for rangeland wool and sheep producers. Run with MLA	
Sheep Connect – NSW	A one-stop-shop for sheep-related events in for NSW and ACT woolgrowers	
BestWool/BestLamb – Vic	A self-directed learning network for Victorian sheep and wool producers	
Sheep Connect – SA	Connects people in the business of sheep across South Australia	
The Sheep's Back – WA	Seeks to deliver increased profitability to Western Australian sheep enterprises	
Leading Sheep – Qld	More profitable Queensland sheep and wool industry through new technologies, knowledge and skills	
Sheep Connect – TAS	Valuable, relevant and timely farming systems information to sustain profitable sheep enterprises	

As part of the wool industry audit conducted in the development of this plan, a compilation of current private and public resources that operate in the adoption/extension space was also undertaken. A total of 218 people have been identified. However, this listing should not be assumed to be complete.

Future extension investment to support the wool industry will require ongoing collaboration between multiple organisations (both public and private) whilst being tailored to specifically meet the needs of the producer. Increasingly, this will need to focus on the 'sheep industry' (rather than on the wool industry (i.e. covering both sheepmeat and wool). Use of new communications technology and other innovative processes will be also become increasingly critical as there is greater competition for time and resources.

The previous National Wool RD&E strategy identified the key elements of a long term strategy for extension leading to on-farm practice change. These are listed in Appendix 4.

From an education perspective, dropping enrolments in sheep and wool sciences prompted the Australian Wool Education Trust (AWET) to license education modules developed from Sheep CRC1 (and other sources) and to facilitate their delivery via lecturing resources delivered at the UNE as well as to students from other universities. AWET also provides travel assistance to such students.

Table A4.7 Facilities available for wool RD&E (2015)

NAMES OR RESEARCH FACILITY & LOCATION	GENERAL DESCRIPTION	AGRO ECOLOGICAL ZONE	FARMING SYSTEMS COVERED	CARRYING CAPACITY AND CONDITION
WESTERN AUSTRALIA				
DPIRD / Sheep CRC. Katanning Research Station, WA 6317	Well established research station with sheep handling infrastructure and staff	Mediterranean	Mixed enterprises of cereals and sheep, migher proporrtion of cereals	8 DSE (winter grazed) (8000 DSE)
DPIRD – Mt Barker	Well established research station with sheep handling infrastructure and staff	Cold, Cool Temperate	Mixed enterprises of cereals and sheep, higher proportion of sheep	14 DSE (winter grazed) (8500 DSE)
UWA Farm Ridgefield, Pingelly, WA	1600 ha crop-sheep farm, profit focus	Dryland mediterranean	Grazing sheep (meat, wool); Crops (cereals, canola); Carbon farming; Biodiversity management; Socioeconomic well-being of farming communities	7000 good
NSW				
UNE/Sheep CRC. Kirby Research Station, Armidale NSW 2350		Cold/Cool Temperate	Fine wool sheep and cattle, agro forestry and mixed farming systems research.	6-10 DSE
University of Sydney, Schoolof Veterinary Science, Camden, NSW		Mild/Warm temperate	Grazing	12 DSE
University of Sydney, Arthursleigh Farm, Marulan, NSW		Cool/cold temperate	Grazing	12 DSE 10,000
Orange Agricultural Research Station – Orange	140 ha improved pasture paddocks, animal handling facilities and laboratory	Cold/Cool Temperate	Extensive grazing	600 DSE in summer 300 DSE in winter
Trangie Agricultural Research Centre	3900 ha facility, focus on rangeland management, Merino genetics research, development of conservation-farming technology	Low rainfall/ rangelands	Mixed farming	Carrying capacity 10,000 Research commitment to 8000 dse. Sheep flocks at Trangie are 700 ewes 3900 ha

SPECIFIC ATTRIBUTES THAT THE FACILITY OFFERS RDE	LIKELIHOOD OF RETENTION (HIGH, MEDIUM, LOW)	CURRENT COMMITMENT TO WOOL (%)	POTENTIAL COMMITMENT TO WOOL (%)
All modern sheep handling buildings, yards equipment, and low labour and stock stress devices. In door/undercover facilities for pen feeding experiments; access to modern research laboratories, offices and facilities	High	50%	50%
All modern sheep handling buildings, yards equipment, and low labour and stock stress devices. In door/undercover facilities for pen feeding experiments; access to research laboratories, offices and facilities	High	50%	50%
Focus on breeding the 'ideal' sheep for the ideal farming system for 2050, with versatile grazing systems (inclung shrubs) integrated with other enterprises (crops, biodiversity). Highly controlled management: animal welfare & ethics; greenhouse gases; risk of livestock water supply)	High	20% of farm profits	20% of farm profits; long-term commitment
Research mainly associated with' Smart farm' - new precision agriculture technologies, including Genetic and nutrition, animal behaviour and welfare, pasture management, soil moisture and crop yield mapping, precision agriculture research	High	50%	50%
Modern laboratories supporting ruminant health, parasitology and pasture research. Modern facilities for ruminant production, health and welfare and biosecurity research, including pens and small paddocks for intensive research	High	25%	
Commercial fine wool self-replacing flock. Access to ewes and lambs	High		
~800 mm/yr High elevation 922m ISO Accredited Labs Laboratory and office space, sheep quarantine areas and shearing shed	Medium	0%	15%
High security irrigation water , well supplied with paddocks, yards and associated infrastructure, extensive infrastructure (offices, workshops, library, seminar facilities) The property is well supplied with paddocks, yards and associated infrastructure, including 72 x 4ha paddocks that are used for joining and lambing of ewes in single sire mating groups	High	13%	25%

Table A4.7 Facilities available for wool RD&E (2015) (continued)

NAMES OR RESEARCH FACILITY & LOCATION	GENERAL DESCRIPTION	AGRO ECOLOGICAL ZONE	FARMING SYSTEMS COVERED	CARRYING CAPACITY AND CONDITION
NSW				
Centre of Excellence for Southern Farming Systems Wagga Wagga	895 ha Centre of Excellence for Southern Farming Systems and Viticulture	Mid/Warm temperate Zone	Mixed Farming	893 ha 600 mm 1000 DSE
Cowra Agricultural Research Station – Cowra	375 ha Centre for Sheep Meat Development	Mid/Warm temperate Zone	Mixed Farming	305 hectares
Glen Innes Agricultural Research and Advisory Station	585 ha high rainfall station for grazing research and pasture research	Cold/Cool Temperate	Extensive grazing	585ha
Condobolin Agricultural and Research Statio	Research Station	Low rainfall/ rangelands	Mixed Farming	1722ha Rainfall of 427mm
Elizabeth Macarthur Agricultural Institute	1600 ha Centre for Animal and Plant Health. Centre for NSW veterinary research and diagnostic services	Mild/Warm Temperate	Extensive grazing	
Elizabeth Macarthur Agrisultura Institute	Centre for Animal & Plant Biosecurity – Research station and Lab Facilities	Sydney Basin	Mixed Farming – Fodder Crops, Dairy and Sheep	Total 1600 ha. Currently: – carrying 1700 sheep.
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	Low rainfall/ Rangelands	Mixed Farming	5750 DSE across Yanco and LFS
CSIRO, Chiswick, NSW	1510 ha. Excellent	New England. Summer predominant rainfall	Grazing only – sheep and cattle	8,000 DSE

SPECIFIC ATTRIBUTES THAT THE FACILITY OFFERS RDE	LIKELIHOOD OF RETENTION (HIGH, MEDIUM, LOW)	CURRENT COMMITMENT TO WOOL (%)	POTENTIAL COMMITMENT TO WOOL (%)
Primarily plant breeding and evaluation programs, ruminant nutrition and feed quality analysis, stateof-the-art animal nutrition research facilities, supported by high quality laboratory	High	0	20%
Excellent research facilities, supported by ISO 9001 accredited meat laboratory in DII, focus on genetics, meat quality, nutrition, reproduction, lamb survival and market development. Meeting room facilities, good livestock/sheep handling facilities	High	0	50%
Good infrastructure, modern cattle and sheep yards, shearing shed, glasshouses, highly improve temperate grazing	High	10%	20%
Currently a commercial flock	High	0	35%
Parasitology research, CAT scanning capability, maintenance of original Macarther sheep bloodlines.Large animal grazing capability and irrigated pastures	High		
Animal Health and Biosecurity Research in Virology, Bacteriology, Parasitology , Genetics. Electron Microscopy and CT scanning. Numerous laboratories and holding facilities including isolation facilities. Extensive paddock and yards system. State Veterinary Diagnostic Laboratory (SVDL)*	High	50% Total ha 25% flock currently involved in RD&E	75% flock for RD&E
High security irrigation water, capacity for surplus water use from Griffith Research Centre, MN2 BJD status, good animal handling facilities, and extensive general infrastructure. Laboratories	High	0	0
History of running genetics resource flock and more recently breech strike flock. Facilities available for quarantine work. Laboratory complex available (up to 60 people for office and lab space). Modern yards, surgery etc	High	10-20%	75%

Table A4.7 Facilities available for wool RD&E (2015) (continued)

NAMES OR RESEARCH FACILITY & LOCATION	GENERAL DESCRIPTION	AGRO ECOLOGICAL ZONE	FARMING SYSTEMS COVERED	CARRYING CAPACITY AND CONDITION
VICTORIA				
Dookie – Farm and animal house	Can be configured for various activities	Nth Vic crop & grazing		50 head in shed 6,000 head
Multiple commercial clients – Mackinnon Project	Commercial flocks	SE Australia	Wool; wool/lamb;wool/beef;wool/crop; mixed grazing/cropping	Varied
Vic DEDJTR, Hamilton	1500 Ha	Western District, Victoria	Sheep focus, especially sheepmeat. Also high-rainfall cropping	2,000 - 3,000
Vic DEDJTR, Attwood	Offices and laboratory	Outer suburbs, Melbourne		
SOUTH AUSTRALIA				
Struan Research Centre	1080ha facility and 307ha at nearby Kybybolite Research Centre for sheep	Naracoorte 5271	Mixed farming	Cattle facilities state of the art Good-average
Minnipa Agricultural Centre	1000ha broad acre facility	Minnipa	Mediterranean	Good
Turretfield Research Centre	650ha facility, adjoins 400ha Kingsford property, with operational Reproductive Biology laboratory	Rosedale 5350	Mediterranean	Sheep facilities state of the art

SPECIFIC ATTRIBUTES THAT THE FACILITY OFFERS RDE	LIKELIHOOD OF RETENTION (HIGH, MEDIUM, LOW)	CURRENT COMMITMENT TO WOOL (%)	POTENTIAL COMMITMENT TO WOOL (%)
Associated with UoM	High	50	50
Commercial trials	Medium	0.25	50
Has been set up specifically for sheep/sheepmeat work thus can easily be worked for wool. Specialist labs, glass-houses, animal house etc	High	0% specifically for wool although lots for sheep (reproduction, nutrition etc)	25 to 50%
Technograzing area and replicated grazing trials, irrigation security, licensed cattle feedlot, located near major export abattoirs, subdivided suitable for single sire mating groups, paddocks ranging from 0.1ha to 40ha, shearing shed and handling facilities, modern woolshed and undercover yards. 20,000 DSE	High	10%	40%
Low rainfall asset with potential to evaluate grazing management strategies and associated environmental impacts, modern woolshed and yards with autodrafter and associated feedlot area, undercover sheep management area. All sheep EID tagged, wool and meat measurements recorded for minimum past 5 years, full or part pedigree, lambing records and registered with Sheep Genetics.1,500 DSE	High	30%	50%
Single-sire mating paddocks (46), electronic ID facilities, 200 person shearing shed. 8,000 DSE total	High	35%	

Table A4.7 Facilities available for wool RD&E (2015) (continued)

NAMES OR RESEARCH FACILITY & LOCATION	GENERAL DESCRIPTION	AGRO ECOLOGICAL ZONE	FARMING SYSTEMS COVERED	CARRYING CAPACITY AND CONDITION
SOUTH AUSTRALIA				
Turretfield Research Centre	650ha facility, adjoins 400ha Kingsford property, with operational Reproductive Biology laboratory	Rosedale 5350		Sheep facilities state of the art
Roseworthy Campus	1600Ha broadacre facility with trial and laboratory facilities	Roseworthy 5371. Temperate Seasonally Dry Slopes and Plains	Mixed farming	4000
University of Adelaide – wool metrology laboratory	Facilities for measuring fibre diameter, CVFD, staple strength, SL, POB, yield, VM, curvature	Adelaide		
TASMANIA				
Cressy Research Farm (Leased but with access for RD&E)	Medium rainfall mixed farming property with emphasis on grazing	Cool temperate	Mixed farming	N/A

SPECIFIC ATTRIBUTES THAT THE FACILITY OFFERS RDE	LIKELIHOOD OF RETENTION (HIGH, MEDIUM, LOW)	CURRENT COMMITMENT TO WOOL (%)	POTENTIAL COMMITMENT TO WOOL (%)
Single-sire mating paddocks (46), electronic ID facilities, 200 person shearing shed. 8,000 DSE total	High	35%	
Extensive paddock and yard system, animal house, wool metrology lab, CT scanning, extensive laboratory and office space	High	0-5%	20%
	High	0%	100%
Range of soil types, irrigation, smaller paddocks	High	0%	50%

Table A4.8 Flocks available for wool RD&E (2015)

NAMES OR RESEARCH FACILITY & LOCATION	AGRO ECOLOGICAL ZONE	EWE NUMBERS	SPECIFIC ATTRIBUTES THAT THE LIVESTOCK OFFERS RDE
WESTERN AUSTRALIA			
WA – Katanning Research Station	Mediterranean	1,700	
WA – Mount Barker Research Station	WA South West	650 850	Yardstick research project Breech strike
UWA Farm Ridgefield, Pingelly, WA	Dryland mediterranean	5,000	Commitment to Merino ewe base and grazing systems; relevant genetics for the long-term (eg, worm-fly resistance, maternal efficiency); focus on animal welfare & ethics, reproduction, greenhouse gas emissions; Maternal Efficiency Flock; UWA Temperament Flock
NSW			
UNE – Kirby Research Station	Cold/Cool Temperate	1,500	Sheep CRC information nucleus flock Genetic traits
NSW – Uni Sydney, Vet Sc	Mild/Warm temperate	100 x-bred ewes / 50 wethers	JD free flock; Footrot vaccine trial
NSW – Uni Sydney, Arthursleigh farm	Cool/cold temperate	10,000	Access to commercial flock
NSW – Cowra – INF Flock Followers	Mid/Warm temperate Zone	470	Followers from the Information nucleous flock
NSW – Trangie – CTSE flock	Low rainfall/rangelands	700	Central Test Sire Evaluation Flock
NSW – EMAI – Menangle	Sydney Basin	250 CPE ewes and 450 merino ewes	Camden Park Estate heritage flock. Stock supply sheep carrying specific parasitological infestations/infections. Stock for research trials (virology bacteriology and parasitology)
NSW – Glen Innes	Cool temperate	326	
NSW – Chiswick	Cool temperate	8,000 DSE capacity	History of running genetics resource flock and more recently breech strike flock
NSW – Orange OAI	Cool temperate		550 wethers

LIKELIHOOD OF RETENTION (HIGH, MEDIUM, LOW)	COMMENTS
High	
High (low for breech strike)	Plus 300 adult ewe spares, 500 ewe hoggets, 600 ewe lambs, 530 ram hoggets; 44 adult rams, 600 weaners. Also 600 commercial sheep traded annually
High	The flock represents the vision and long-term commitment of UWA to sustainable grazing systems, and 'clea, green and ethical' livestok management.
High	
Medium – ewes/ Low – wethers	
High	
Med	
High	
High/Medium	Heritage flock – offspring involved in current research. Known susceptible and resistant strains of parasites are maintained. Ongoing research and commercial research requirement.
Low	
High	
Medium	

Table A4.8 Flocks available for wool RD&E (continued)

NAMES OR RESEARCH FACILITY & LOCATION	AGRO ECOLOGICAL ZONE	EWE NUMBERS	SPECIFIC ATTRIBUTES THAT THE LIVESTOCK OFFERS RDE
VICTORIA			
Victoria – Dookie merino flock	Nth Vic crop & grazing	2,500	Known history
Victoria – Multiple McKinnon	SE Australia	20,000+	Commercial flocks in various regions
SOUTH AUSTRALIA			
Minnipa Ag Centre	Mediterranean	500	Full or part pedigreed flock, registered entirely with Sheep Genetics. Low rainfall/mixed farming niche. Established sheep producer network across Eyre Peninsula.
Turretfield Research Centre	Mediterranean	1,800	Fully-pedigreed flock of 300 ewes and rams still maintained on research centre. Registered with Sheep Genetics
Roseworthy	Mediterranean	300	Dual purpose Merino with emphasis on selection for bare breach
Struan Research Centre (incorporating Kybybolite)	Cold/Cool Temperate	1,800 Merino ewes & 2400 Non-Merino ewes	Large numbers available for controlled experimentation in commercial farming system

LIKELIHOOD OF RETENTION (HIGH, MEDIUM, LOW)	COMMENTS
High	
Medium	
Medium	
Medium	
High	
High	

APPENDIX 5: INDUSTRY AND GOVERNMENT RD&E PRIORITIES

There are a range of plans that are relevant to this Wool Industry RD&E strategy including those at Federal, State and organisational levels. During the preparation of this plan, a comparison of these plans was made to examine how well they align. This comparison is shown in Table z below. Further detail can be found in Appendix 5.

A5.1 NATIONAL RESEARCH PRIORITIES (AUSTRALIAN GOVERNMENT)

Since 1994, the Australian Government has 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 that R&D objectives of the Australian Government (as a significant investor in rural RD&E) are met.

The Rural R&D Priorities are developed in consultation with State and Territory governments, industry, research funders and providers. The Priorities enable issues of common concern to be explored in a coordinated and cost-effective way and focus investment in areas of greatest need. They 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 which were developed in 2015 are:

– Advanced technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture;

– Biosecurity, to improve understanding and evidence of pest and disease pathways to help direct biosecurity resources to their best uses, minimising biosecurity threats and improving market access for primary producers;

– Soil, water and managing natural resources, to manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts; and

– Adoption of R&D, focussing on flexible delivery of extension services that meet primary producers' needs and recognising the growing role of private service delivery.

A5.2 NATIONAL WOOL RD&E STRATEGY

It is clearly recognised that all agencies and stakeholders face RD&E budgetary pressures and require the best possible returns from their RD&E investments. In an approach to encourage greater collaboration and reduce duplication between RD&E agencies, national RD&E strategies were developed for a range of agricultural sectors. It was the intention that agencies would build and retain capability in fields that are strategically important to them and the industries they support, leading to the development and maintenance of a nationally coordinated network of RD&E capability.

The Australian National Wool RD&E Strategy was developed from 2009 and released in June 2011. It has sought collaborative efficiencies in the conduct of wool RD&E across Australia. Operational delivery of the strategy has been led by the West Australian and NSW state departments, with AWI's role being to contribute to project scoping and funding where appropriate.

A5.3 A COMPARISON OF PLANS

A range of strategic and operational plans with relevance to the wool industry exist across various industry organisations and agencies. An analysis of these plans has been undertaken to assess consistency across plans, especially in relation to how they align with the Commonwealth's Rural Research and Development Priorities, as well as with the existing Wool Industry National RD&E Strategy.

A snapshot of the comparison of relevant wool industry (and associated) plans is provided below in Table 1 in the body of the document.

It should be noted that a range of other documents have also been reviewed but are not included in the table. These include:

– ABARE (2009), *'Promoting productivity in the agriculture and food sector value chain: issues for R&D investment'* ABARE and BRS report for the Rural R&D Council

– AWI (2015), *Presentation to RMCIC Meeting*, June

– NSW DPI (2015), *NSW Wool Industry and Future Opportunities*. A report to the NSW Department of Primary Industries from Miracle Dog, Poimena Analysis, Scott Williams Consulting and DAFWA

– PIRSA (2013), *South Australian Sheep and Wool Industry ScoreCard Overview* 2013-14

– PISC (2010), *National Beef Production RD&E Strategy*. Primary Industries Standing Committee – R&D Sub-Committee January

– RIRDC (2014), *Assessing the competitiveness of Australian Agriculture – Summary*

– RIRDC & CSIRO (2015), *Rural industry futures – Megatrends impacting Australian agriculture over the coming twenty years*. Stefan Hajkowicz and Sandra Eady

– RMCIC (2014), Sheep and Beef Extension – *a vision and framework for future investment. Discussion Paper – Version 2*

– TFGA (2014), *The Tasmanian Red Meat Industry Strategic Plan*

The Universities involved in the wool industry through both on- and off-farm RD&E tend not to have documented strategic priorities. Research groups at Universities are typically formed along discipline lines (genetics, nutrition, health, reproduction, etc) across species. There are also a range of other national plans with which the wool industry engages, including:

– National Primary Industries Animal Welfare RD&E Framework

– Climate Change Research Strategy for Primary Industries: RD&E Strategy

– (National Primary RD&E Framework) Animal Biosecurity RD&E Strategy

– Australian Wool Industry Emergency Animal Disease Preparedness RD&E Strategy.

Some key observations from this comparison of plans are:

– Collectively, the various wool Strategic and Operational Plans fully cover all of the Rural R&D Priorities

– The strategies and sub-strategies of the National Wool RD&E Plan are also fully covered by the various wool strategic and operational plans

– As expected, AWI's Strategic Plan 2016/17 – 2018/19 has the broadest scope of all plans

– Other plans align well with AWI's plan except in the areas (as expected given the low existing capacity in Australia) of:

  • Innovating product, processing and manufacturing through delivering new products and enhancing efficiency, and

  • Strengthening consumer confidence in woollen products

– Many associated plans cover all aspects of the sheep industry i.e. both sheepmeat and wool, while others also cover other broadacre pursuits such as beef cattle.

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