Australian Merino wool

Ben Lyons, Australian Wool Foundation

A COMBINATION OF SCIENCE, ART AND EVOLUTION

- Today
- Tomorrow
- Product developments and innovations
- Priorities for the future

In 2007 Australia's wool industry celebrated 200 years of commercially exporting to England, it is the fibre of a nation.

Overview

Wool production continues to be one of Australia's most important agricultural industries, representing 6.3% of the gross value of agricultural production and $2.3 billion in export income in 2003-2004.

The current sheep flock of 107 million occupies some 25% of Australia's land mass, with approximately 30% of the flock in the high rainfall zone, 55% in the sheep/cereal zone and 15% in the pastoral zone.

The natural resource base of soil, water and vegetation provide the fundamentals on which the wool industry builds significant economic and social benefits for the nation. In addition, the effective control of pests and weeds increases productivity, reduces production costs and delivers benefits to the natural ecosystems. This all greatly assists wool growers demonstrate their sense of pride in their farms and their desire to see their assets passed on to future generations in better condition.

Merino wool - the perfect choice for today's fast paced environment

Faced with an abundance of choice, consumers will always look for quality. Merino wool is the smart, timeless and versatile fibre choice, with the added advantage of being produced in a natural, sustainable manner.

Time is the most precious commodity for today's consumers, and thanks to evolution and innovation, Merino wool has easy care, quick dry qualities, making them practical and convenient for time-poor consumers. The transeasonal attributes of Merino wool also make it the perfect apparel choice for busy professionals - providing protection from the cold in the harsh outdoor weather whilst providing comfort in air conditioned environments such as offices, public transport and planes.

Recognised by many as the most luxurious natural fibre in the world, Australian Merino wool offers all the qualities that today's consumers need and expect from their garments.

The Australian Wool Industry at a glance

- 30,000 farms
- 1,000 to 40,000 sheep
- 10 bales to 1,500 bales
- Fibre diameter: 11 micron to 40 micron
- Fibre Length: 55mm to 130mm
- Fibre strength: 10 to 65 N/Ktex
- 20,000 different types of wool
- 22,000 registered Woolclassers

The Australian wool industry and the fibre is very diverse owing to it being a product of its natural environment. The grazing industries have a unique opportunity to demonstrate that rural landscapes can be managed to effectively support profitable grazing enterprises, the natural environment and rural communities, while meeting the needs of increasingly environmentally aware consumers.

From 2002 to 2006 AWI's major investment in natural resource management was Land Water & Wool, www.landwaterwool.gov.au. While the Land Water & Wool research component drew to conclusion in 2006, AWI will continue to promote the knowledge and tools developed to woolgrowers and industry via other AWI investments. Other AWI natural resource management investments are drought, rabbits and the development of an environmental assurance system for broadacre producers.

Australia: a unique environment for wool growing

Did you know...Some fast facts about the Australian wool industry

Australia is the world's largest producer of wool.

In 2005/2006 there were 107 million sheep shorn in Australia producing 461 million kg of greasy wool.

Production for 2006/2007 is forecasted to be 425 million kg of greasy wool with production still impacted by the drought.

The Australian flock of 100 million sheep is composed of 88% Merino, 9% crossbred and 3% other breeds as at 1 January 2007.

Sheep graze over 85 m ha of Australia's total land mass. This means on average each sheep has 0.85 ha or 2 acres.

Australian wool production 2005/2006 461 million kg greasy

Australian Wool Exports

Did you know...

Australia is the world's largest producer of wool, producing 27% of the world's greasy wool in 2005/2006.

While Australia produces more wool than any other country, China has the largest sheep population.

Wool exports were valued at $2.64 billion in 2005/2006.

Wool Textiles

Did you know...

In 2008, wool accounted for 1.9% of total world fibre use.

Australian wool is primarily utilised in production of knitwear (27% of our clip), and men's and women's wovens (60%).

Young adults, who dominate global discretionary apparel expenditure, are influenced more by price and performance rather than the textile fibre used.

Worsted fabrics are made with longer fibres that produce a surface that's smooth to touch. Woollens are made with shorter fibres that stand up from the surface and give the fabric a hairy touch.

Wool is natural, biodegradable, naturally flame resistant and able to absorb up to one-third of its own weight in water.

Who is Australian Wool Innovation?

Australian Wool Innovation (AWI) is the world's leading Merino wool fibre marketing and innovation company.

AWI is a not-for-profit organisation investing close to $60 million each year in marketing & research.

Our goal is to build demand for Australian Merino wool and the profitability of our shareholders: Australian wool growers

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Our goal is to build demand for Australian Merino wool and the profitability of our shareholders: Australian wool growers

How do we do this?

1. Development, marketing and innovation right through the apparel pipeline – from farm to fibre to fashion.
2. AWI develops business-to-business relationships with global apparel decision makers, leading product developers, designers, manufacturers and retailers.

- 60% of investment is directed at marketing and post-farm gate R&D, and 40% is directed on-farm
- AWI has a long history of investment in environmental assurance and ethical production.
- For example, from 2001 to 2006, AWI invested $20m in the Land Water Wool Program, as part of a $60 m joint venture

Fine and superfine Merinos

Fine and superfine Merinos are found in the northern and southern tablelands of New South Wales, the western districts of Victoria and the midlands district of Tasmania.

The super-fine wool Merino produces wool that is of excellent colour, soft handling and dense, with a fibre diameter of 18 microns. Staple length is about 70mm.

The fine-wool Merino possesses a bright, white, dense fleece. Fibre diameter is 19 microns with a staple length of about 75mm.

Medium-wool Merinos

Medium-wool Merinos are found throughout New South Wales, Queensland, Victoria and Western Australia. They are grown primarily for wool production. Their wool is almost totally absorbed by the textile trade. Their fleece is heavy and soft handling, of good colour with a fibre diameter of 20-22 microns and a staple length of approximately 90mm.

Strong-wool Merinos

Strong-wool Merinos are most prominent in western New South Wales, South Australia and Western Australia. The strong-wool Merino produces a heavy seven-to-eight kilogram fleece of approximately 100mm staple length with a fibre diameter of 23-25 microns.

The Fonthill Merino

The Fonthill Merino was evolved by crossing American-bred Rambouillet Merino rams with a fine-wool Saxon strain of Merino. The major objective was to increase the genetic potential of an easy-care type sheep to produce wool. Fonthill ewes produce 20-22 micron wool.

The Booroola Merino

The Booroola Merino was originally developed on the Southern Tablelands of New South Wales and is the subject of a continuing developmental programme initiated by Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO).

AWI work from on farm right the way through to the retail shelf: Just one example is with New wool harvesting technologies

AWI is continually researching alternative harvesting technology in order to improve workplace safety and boost the quality of the wool gathered. These developments include shearing platforms such as the Peak Hill ShearEzy UPSP and biological harvesting.

Australian Wool In-novation Limited (AWI) is developing new 'add-on' shearing technologies to make current and future wool harvesting equipment safer and more effective.

This is a core part of the company's strategy to cut sheep shearing costs and improve efficiencies in the wool harvesting sector.

Add-on technologies being investigated include:

- safer conventional shearing handpieces;
- new handpiece technologies; and
- new shearing shed designs based on best practice occupational health and safety (OH&S)
- better methods of restraining sheep on shearing and crutching trailers.
- Improvements to handpieces, better shearing shed designs and implementation of

other shearing technologies should benefit woolgrowers, shearers and wool handlers by:

- improving wool harvesting efficiency;
- cutting the costs of shearing;
- improving clip preparation quality and value; and
- making shearing and wool handling safer and more attractive professions.

Developing markets

The fundamental premise of AWI is to drive research, development and innovation that will increase profitability for Australian woolgrowers. At an industry level this is done by the development of business in new and existing markets.

Our strategy

One of AWI's primary business objectives is to foster the creation of new markets for Australian woolgrowers. These markets are developed by building close business partnerships in new and existing markets.

New Markets

The rapid economic development and growth of manufacturing in countries such as India, Russia and, particularly, China are offering many new opportunities for Australian wool.

Building existing markets

Traditional markets are fundamental to the direction of the industry and are home to many powerful companies and influential designers. AWI works very closely in collaboration with business partners to create products that open new possibilities within these markets.

China

As a global centre for production and as Australia's most significant export destination for wool, issues affecting trade with China are vital.

Overview

At the end of the wool pipeline, AWI is creating huge new opportunities for Australian woolgrowers amongst international markets.

The works being undertaken with our business partners in both new and established markets, particularly in China, have the potential to deliver very significant returns.

The establishment of AWI offices in key new markets is fundamental to ensuring that we understand these regions, their consumers and are as close to our business partners as possible.

Product development

Fundamental to the ongoing success of Australian Merino is the creation of innovative apparel products and technologies that are sought-after by the world's apparel markets and consumers.

AWI and its business partners actively seek out what retailers want to sell and their customers want to buy and then enage people to produce fabrics to meet these needs directly.

Our Strategy

AWI manages highly focussed research and development programs to create unique and innovative products. These products are sold into or developed collaboratively with our global business partners.

Textile innovation

Maintaining the best prices and highest demand for Australian Merino requires that AWI is constantly bringing innovative products to market, products that exemplify wool's advantages, and add new characteristics that consumers want. Merino Care, Merino Soft and Merino Visual are examples of product innovation from the knitwear segment.

Overview

The Australian Merino product that AWI develops and that manufacturers and retailers deliver to consumers is the fundamental working of the wool pipeline.

Driven by innovation, but always targeted to addressing a specific challenge or consumer desire, AWI undertakes product development to always expand the markets for Australian wool.

Of particular importance are the relationships that AWI shares with many significant business partners with whom the creation of remarkable, innovative wool products is undertaken.

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Merino Care

The Merino Care range has been created to ensure Merino wool garments are as easy to maintain.

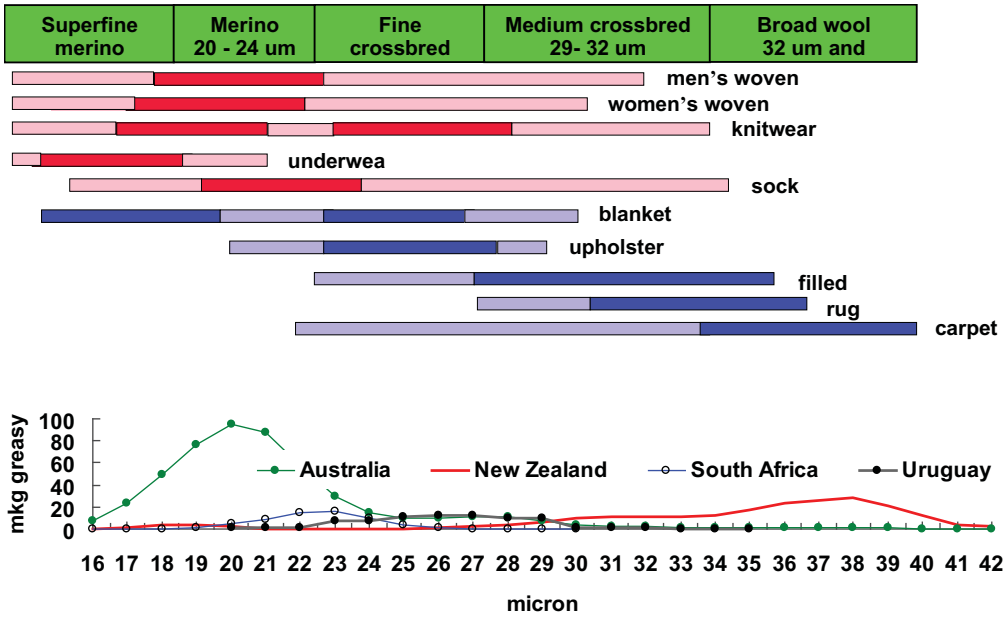
Merino Soft

The Merino Soft range utilises unique production and treatment methods to deliver the softest, most luxurious Merino garments.

Merino Visual

AWI developed a number of techniques that make garments much more appealing to the eye for consumers.

Wool Usage and Fibre Diameter



Global fibre market

- Merino wool destined for world clothing markets (<16-24 micron) dominates the Australian wool supply.
- This reflects both the adaptability of Merino sheep to Australia's many production environments and the higher value of finer Merino wool.
- In 2000-2001 a total of 3,630,000 bales were tested: 87 per cent were 24 microns or finer (apparel), 18 per cent were 19 microns or finer, and 13 per cent were broader than 24 microns.
- During the 1990s, supply of wools from Australia - the largest wool producer - and from most other regions fell, with the exceptions of China and New Zealand.

- Wool's share of global fibre usage has declined significantly.
- The world market for fibres has tripled in 40 years, but synthetics have accounted for most of the growth.
- Wool use has been regular in quantity but small in market share; from near 10 per cent of fibre use around 1960 falling to 2.5 per cent in 2000 (or about five per cent of apparel fibre).

Australian Wool Fibre

There has been a significant change in the fibre diameter (micron) profile of the Australian clip. In 1993/1994 only 8.5% of the total clip was 19 micron or finer.

Twelve years later (2005/2006), 31% was 19 micron or finer. In 2006/2007 it is predicted this proportion will reach 36%.

Wool fibres are mostly made of protein with a small amount of fat, calcium and sodium.

As it grows from the sheep's skin, wool naturally groups into staples which each contain many thousands of fibres.

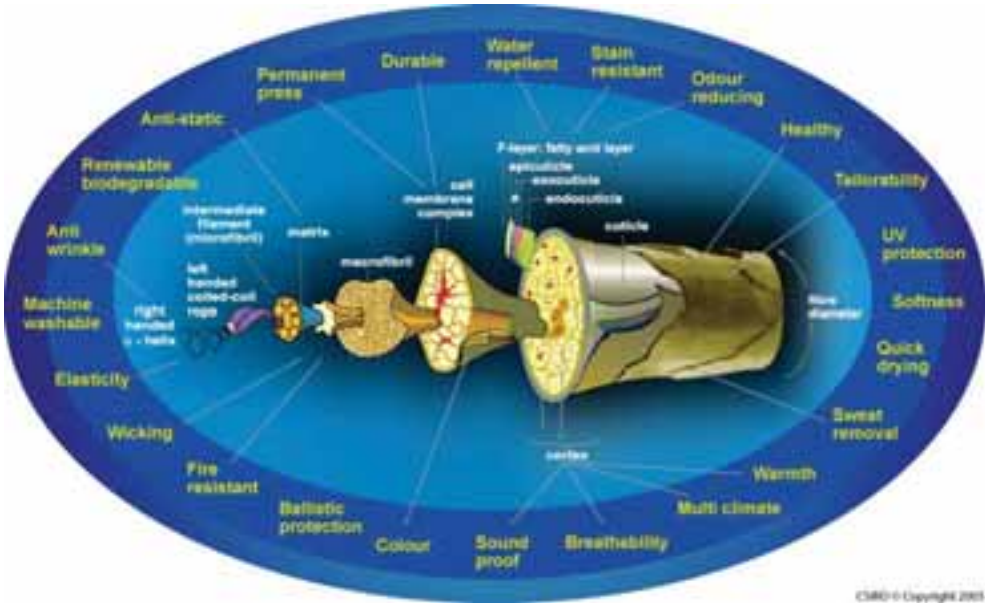
After shearing, wool is classed into five main categories: fleece, pieces, bellies, crutchings and locks.

The most important characteristics of wool in determining its greasy value are fibre diameter, staple strength, staple length, vegetable matter, colour and yield.

MILLIONS OF YEARS OF EVOLUTION MAKE MERINO THE PERFORMANCE FIBRE

Proof of the attributes of Australian Merino

The Australian Merino fibre has a remarkable range of natural attributes. In this section, through being introduced to some of its physical and chemical properties, you'll find out why.



The fineness of the Merino fibre makes it soft, and provides great insulation, how its scales make it water repellent and help resist stains, how its ability to absorb moisture aids breathability and contributes to odour resistance, how its elasticity delivers excellent drape and eliminates wrinkles, and more.

WOOL HAS INTRINSIC PROPERTIES THAT TRANSLATE TO GARMENT FUNCTIONALITIES THAT MAKE IT IDEAL FOR APPAREL USE.

- Natural Breathability
- Natural durability
- Natural stretch and drape
- Natural odour resistance
- Natural temperature control
- Natural fire and static resistance
- Natural UV protection
- Natural sweat and moisture control

Water Repellant

While the core of the Merino fibre is hydrophilic and capable of absorbing up to a third of its dry weight in moisture vapour, the surface of Merino is hydrophobic. That is, it repels liquids.

Waxy coating

The Merino fibre has a very thin, waxy, lipid coating chemically bonded to the surface. This bonded layer extends over the overlapping scales on the surface of the fibres and cannot be easily removed by scouring, washing or processing. A consequence of this surface layer is that Merino fibres have a naturally low surface energy - lower than cotton, nylon or polyester and comparable with the hydrophobic surface of polypropylene. (Fig 1)

It's this low surface energy that makes Merino water-repellent because droplets that touch lightly on the surface of Merino will bead and roll off before being absorbed into the fabric.

Summary

A waxy lipid coating on the scales of the Merino fibre lower its surface energy and make it naturally water repellent.

Further reading:

CSIRO, "Stain resist, anti-soiling and easy clean", 2005.
Holme, I., (2003) Water-repellency and water proofing, in Heywood, D. (Ed.) Textile Finishing, Bradford, UK: Society of Dyers and Colourists, pp. 135-213.

WOOL: NATURALLY ABSORBS WATER VAPOUR AND IS BREATHABLE

SOURCE: CSIRO

- Wool is an active fibre.
- It is able to absorb and desorb moisture vapour as conditions around it change.
- This gives wool is its fantastic 'comfort' properties and makes it 'breathable'.

Breathability

When someone says a garment "breathes" they are referring to its ability to dissipate perspiration so that they don't feel "clammy". The scientific term for "breathability" is moisture buffering.

Moisture buffering

Moisture buffering refers to a textile's capacity to absorb moisture vapour from the micro-climate above the skin when there is a rise in humidity and release it again if the humidity should drop. A textile's propensity to absorb moisture vapour is known as its hygroscopicity, while the weight of water able to be absorbed by a fibre as a percentage of its dry weight is known as the regain.

Merino has highest regain

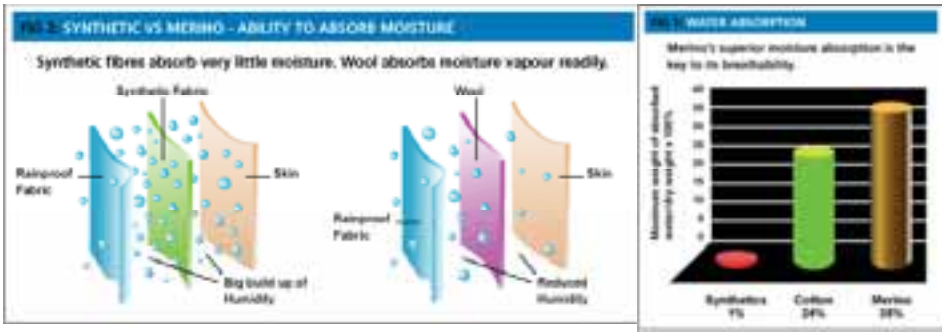
For synthetics the regain can be as low as 1%, for cotton it's 24%, while Merino has the highest regain with an ability to absorb 35% of its own dry weight in water. (Fig 1)

Merino has the greatest capacity to absorb moisture vapour of all apparel fibres because its internal structure is more complex than synthetic fibres, creating more sites where moisture can bind. This higher regain means that Merino is better able to absorb the moisture vapour produced by the wearer and so lower the humidity in the micro-climate between the skin and the garment.

MERINO PERFORMANCE FACTS

Moisture transport

Further enhancing Merino's perception of breathability is its superior moisture transport. When a person is sweating the air near the skin is humid while that further away is drier. Just as different textiles have varying abilities to absorb moisture vapour as they move towards sweating skin, so do they vary in their capacity to release it again when they move away into the drier air.



Merino's superior moisture transport

Tests conducted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia showed that Merino was twice as effective at absorbing and releasing sweat as an equivalent polyester fabric. It is this ability to not just absorb more moisture vapour but also release it that explains why Merino is so effective at reducing the uncomfortable sensation of clamminess.

Temperature drop with vaporisation

There is a further factor that enhances the qualitative assessment that Merino feels more "breathable". When a textile absorbs liquid sweat within its internal structure and it evaporates at the surface there is an accompanying drop in temperature. For most textiles, this effect is negligible because of their limited capacity to absorb moisture. But, because Merino can absorb so much liquid, the temperature drop is noticeable.

Heat of sorption

Conversely, if the ambient temperature should drop, moisture from the air can be absorbed by Merino and converted to bound liquid, a process that produces a rise in temperature known as the "heat of sorption".

Thermo-neutral

This ability of Merino to respond to changes in the microclimate above the skin, producing a drop in temperature when you sweat, and a rise in temperature when you chill enhances the qualitative sensation to the wearer that Australian Merino has excellent "breathability".

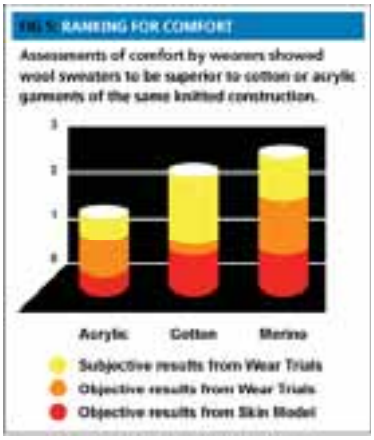
Laboratory proof of Merino's breathability

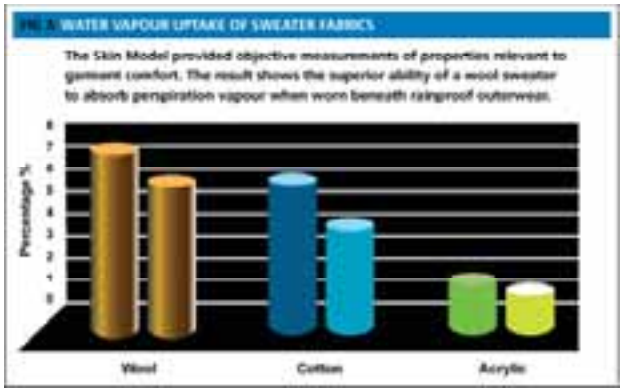
A number of tests have been done which support the anecdotal evidence concerning Merino's "breathability".

The Hohenstein Institute in Germany performed trials to investigate wearer comfort when sweaters made from different textiles were worn under rainproof outerwear, a common combination for sport and outdoor enthusiasts.

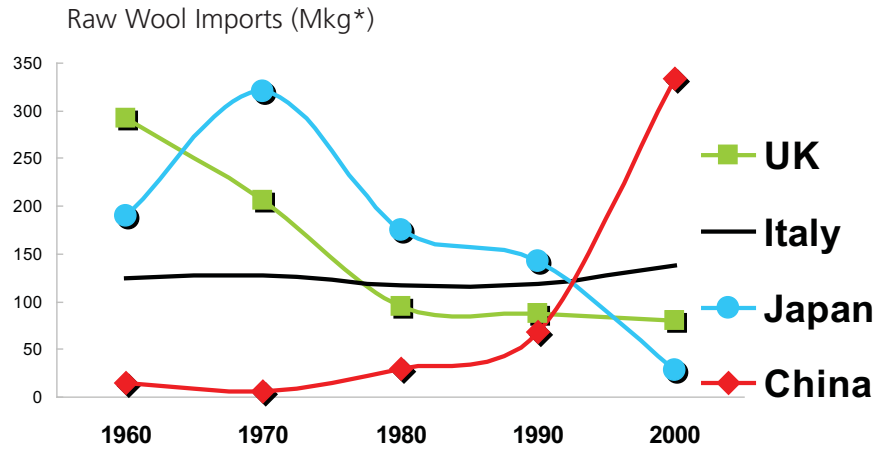
Merino superior to cotton and acrylics

The Hohenstein tests confirmed that a Merino sweater absorbed more moisture vapour than cotton or acrylic equivalents and, in wearer trials, both objective and subjective assessments rated Merino as providing superior comfort to either cotton or synthetics





THERE HAS BEEN A HUGE GEOGRAPHIC SHIFT IN GLOBAL WOOL PROCESSING



The wool marketplace

Twenty years ago, most Australian wool was transported to Japan, the USSR and Western Europe. Today, China and Italy are the major destinations for Australian greasy or part-processed wool. A substantial part of Japanese wool processing capacity has been relocated to lower cost China, reflecting again the price pressures on textile manufacture.

World trade in fabric and finished products has expanded rapidly as retailers source goods from manufacturers worldwide. Alongside reductions in overall wool, trade in yarn, fabric and apparel items has grown 12 per cent. This is expected to escalate as trade barriers are reduced.

Early stage processing in Australia has expanded in the last decade also in response to economic, marketplace and environmental realities. Over 30 per cent of wool is scoured and much made into tops before being exported.

However, spinning, weaving, knitting and fabric production declined even though Australian import tariffs are continuing until 2005. The year 2000 saw an eight per cent increase in local yarn making offset by a 13 per cent fall in fabric making and higher imports of yarns and fabrics.

Wool, as a naturally grown and complex product, is expensive compared to alternatives at all stages - from raw material purchase through to spinning where the additional cost is particularly high.

AWI invests in research, development and innovation that aims to reduce costs and improve production efficiencies at all stages along the wool pipeline.

That wool continues to sell in the face of such comparative costs is testimony to wool's intrinsic qualities.

There are two distinct methods of wool yarn production:

1. The Worsted System
    - Uses longer length wools (greater than 65mm staple length).
    - Wool is made into tops before spinning into yarn.
    - Eighty per cent of Australia's wool is processed this way.

2. The Woollen System
    - Uses much shorter wool such as locks, crutchings, bellies and lambs wool.
    - All carbonised wool and a substantial amount of scoured wool is processed this way.
    - Produces a bulkier yarn that is used in knitting and some weaving.

The six major processes of worsted yarn are:

Scouring - a washing process that removes dust, suint (sweat) and wool wax.

Carding - rollers covered with teeth tease apart the staples of wool, laying the fibres nearly parallel to form a soft rope called a 'sliver'.

Combing - the comb separates short from long fibres, ensuring that the long fibres are laid parallel to produce a combed sliver called a 'top'.

Drawing - several tops are drawn out into the thickness of one, to thoroughly blend the wool and ensure evenness or regularity of the resulting 'roving'.

Finisher drawing - reduces the roving thickness to suit the spinning operation and further improve evenness.

Spinning - insertion of twist into the yarn to give strength to the finished yarn.

The woollen processing system can be varied to meet various market requirements. Variance in processing methods occurs either chemically or physically.

- Chemical processing variances include:
  - Shrink proofing;
  - Fire proofing; and
  - Moth proofing.
- Physical processing variances include:
  - Blending exotic fibres, such as cashmere or silk; and
  - Blending man-made fibres.

Worsted vs woollen fabrics

- Worsted fabrics are often more expensive than wool spun products due to the longer raw material to resultant yarn processing route used.
- Worsted fabric is stronger and wears better than a woollen spun fabric of equivalent weave construction and fabric weight.
- Worsted fabrics are preferred for trousers, suitings, other garments and upholstery fabrics where a smooth finish is required.

- Woollen spun fabrics are used for jackets, coats, skirts, upholstery fabrics, rugs and blankets where bulk and textured finishes are desirable.

Further results of research

The results of research in 2005-06 saw the establishment of a variety of commercial contracts that will directly deliver benefits back to Australian woolgrowers.

Each of these have been expressly developed to make wool garments easier to produce and ultimately more wearable:

- Chlorine-free continuous shrink-resistant treatment for wool loose stock and tops
- Novel self twist yarns using modified false twist spinning techniques to develop a range of knitted and woven apparel products
- Performance-plus protective clothing made from mid-micron Australian Merino fibre
- Light weight, low pilling, woollen knitwear using compact yarn
- Australian Merino range of products that cater for the leisure / travel market in conjunction with Purely Merino
- Novel knit fabric development and commercialisation of a range of novel, low cost, wool-rich fabrics based on AWI patented technology
- Performance Plus: the introduction of new finished, fibre blends and chemical applications to wool to add value and exceed the requirements of the military, corporate, institutional and industrial sectors

Environmentally assured Australian Merino wool

Today you cannot make a decision without thinking of the repercussions for the environment. This goes for lifestyle decisions regarding your food, car, plane ticket - even your clothing.

We are all aware of the current and growing concerns regarding climate change, the environment, carbon emissions, our own ecological footprint, and local and global impact.

- 'Green' fashion is growing in popularity throughout the western world
- Iconic brands and new companies are opting for textiles that leave a minimal ecological footprint

But where does Australian Merino wool fit in this story?

The swing towards eco-friendly products brings opportunities for the global textile industry, and for their part, Australian woolgrowers. After years of rampant consumerism, active and informed consumers are insisting on greater integrity and authenticity in the products they buy.

Research conducted by AWI strongly supports the importance of this emergent sector. A sentiment survey of 22,000 consumers in 11 key markets indicates a significant consumer market segment with a preference for natural, organic products.

UK retail giant Marks & Spencer recently announced a five-year, £200 million eco-plan that forecasts that organic wool and cotton apparel sales will triple.

Australian Merino wool growers

- Care for and enhance the environment upon which they earn their living: "the environment is their lifeblood"

- Improvements in Aus-tralia's farm practices are aimed at rehabilitating land; halting and reversing the loss of native vegetation; improving water quality; and enhancing biodiversity

"What about organic Australian Merino?"

We are often asked this question by retailers and suppliers and our reply is simple. What do you mean when you say "organic?" Because if you mean a totally natural and renewable fibre, that is grown and harvested with very little or no use of synthetic chemicals, then we have that already.

AWI does not use terms like "eco" and "organic" simply because our fibre is made naturally from the combination of sunlight, water and grass. Australian Merino wool is com-

pletely natural, biodegradable, sustainable (NBS), and authentic, making it an ethical choice for consumers.

Naturally Australian Merino: It comes with the Territory

Merino is a naturally luxurious and high performance fibre that has evolved over millions of years to create the most effective all-weather protection against the elements known to man. Nature designed the Merino fleece to protect from the wind, rain, and in Australia's case, extremes of our fierce summer heat and sunshine, and alpine cold. No man made fibre can come close to replicating Merino's naturally occurring combination of attributes.

Natural

- Australian Merino wool has excellent 'natural' credentials
- It is a renewable, biodegradable protein
- More than 99% is produced in extensive grassland terrain
- Little or no synthetic chemicals are used in the production of Australian Merino wool
- The very small amount of chemicals used on wool are for the benefit and health of the animal

Biodegradable

- Australian Merino is extraodinarily durable, it will degrade and return to its component elements
- The natural fibre is made from protein, similar to that found in human hair
- Easily decomposes back into the earth, unlike most synthetics such as polypropylene which takes thousands of years to decompose

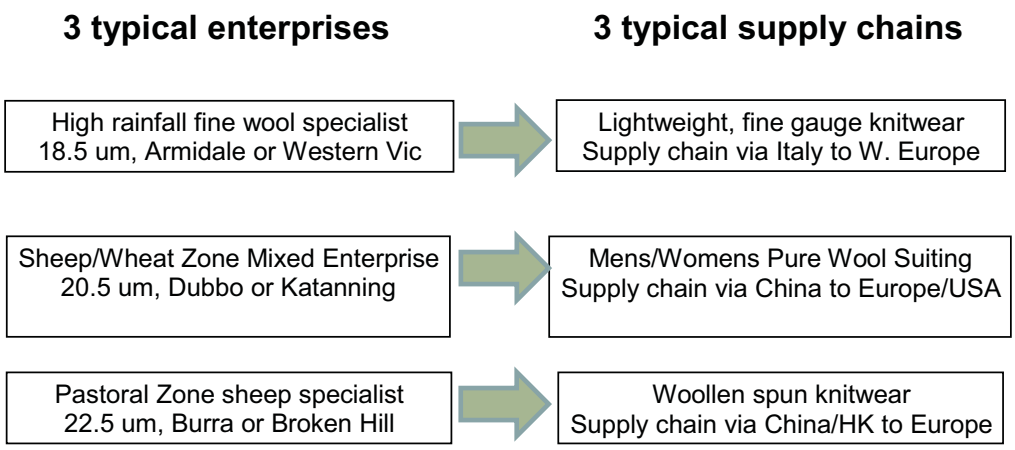
Sustainable

- Australian Merino is a sustainable resource
- Every year a new fleece grows upon the sheep's back and can be removed without harm to the animal
- Made from the simple combination of sunlight, water and grass

Verification of Australian Merino (VAM)

AWI offers a 'Verification of Australian Merino' which allows businesses to certify and promote the origin of the fibre, and therefore its natural credentials to customers.

ENVIRONMENTAL PATHWAYS AND LCAS ARE CHALLENGING: DIVERSITY IN PRODUCTION AND FINAL MARKET!



Being responsible…from fleece to fabric

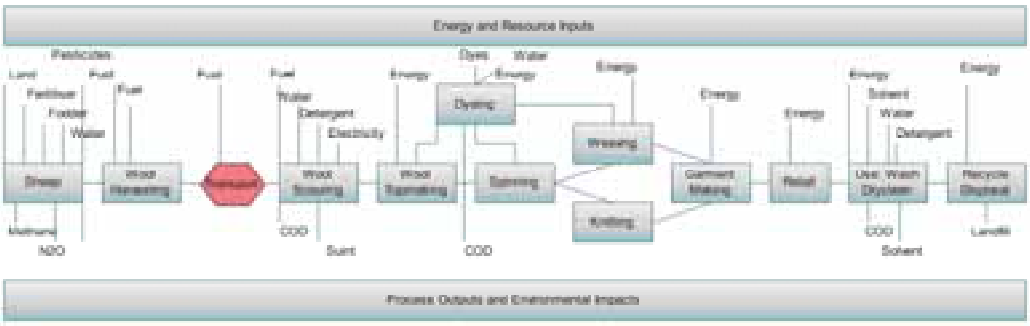
AWI has engaged the Australian Commonwealth Scientific and Industrial Research Organisation to conduct independent research on the "Environmental Pathway" - the processes required to transform wool from fleece to fabric. AWI will work in countries such as India, Bangladesh and China to look at improving the wool textile production and corporate social responsibility practices from chemical, dye and energy use to ethical labour practices.

Australian Merino wool is the premium natural fibre solution. Consumers can buy authentic, natural Australian Merino with confidence, knowing it is the eco-friendly choice.AWI are an investment company protecting and promoting wool as a natural and ecologically sound textile solution. Therefore we need to know where our greatest impacts are and to work to reduce these. Hence – we undertook a pilot Life cycle assessment. We do not look at other fibres and say they are BAD: this is not constructive

AWI initiated its LCA project in 2006, in partnership with CSIRO. The LCA scope is Defined as follows: 3 typical wool supply chains.

- Fine wool, high rainfall -> Western European use
- Medium wool, mixed enterprises -> Asian suits
- Coarse wool, pastoral zone -> outerwear knits.
- Farm to retailed garment, then back to soil (complete life cycle).
- The project adopted ISO 14040 as a template, and focussed on water and carbon dioxide emissions.

Project Scope



The LCA study identified many gaps in our knowledge:

Carbon sequestration in soil – how much of an impact or opportunity?

Garment wear life – durable vs. rapid turnover and replacement?

Post-purchase use and disposal. We suspect most wool is recycled via Op shops, then into cardings, into geotextiles and insulation etc.

For example, Japan has run very successful clothing recycling campaigns.

Summary of our LCA experience:

- Critical to know environmental footprint, for long-term future
- Assumptions are critical – rubbish in, rubbish out
- Most water use post farm, and most CO2-e post farm. Biogenic methane remains a major issue.
- Australian impacts equivalent to that of 2% of Australia's human population.
- We need to do more research, to address gaps in our knowledge
- We are continually looking at opportunities to reduce key elements of the footprint.

What are the opportunities to reduce our carbon footprint?

Australian industry is looking at methods for reduction in on-farm emissions

Sheep CRC looking at genetics – the evidence is that there is considerable scope for reduction in per-head emissions.

The greatest challenge for Australia appears to be enteric methane, and globally, using and heating water as part of garment care.

Product innovations such as the shower suit fit with our environmental strategy.

There is scope to reduce livestock emissions:

For example, Substantial differences have been shown to exist within breeds of cattle in amount of emissions, independent of diet.

Also, Red Kangaroos don't produce methane, yet are a ruminant.

Australian industry is looking at methods for reduction in on-farm emissions. As part of a $100
million investment by the industry and the Australian Government, researchers are looking intensively at developing required genetic and management tools for growers.

MERINOfresh™
Based on the **shower suit** technology developed with partners in Japan.

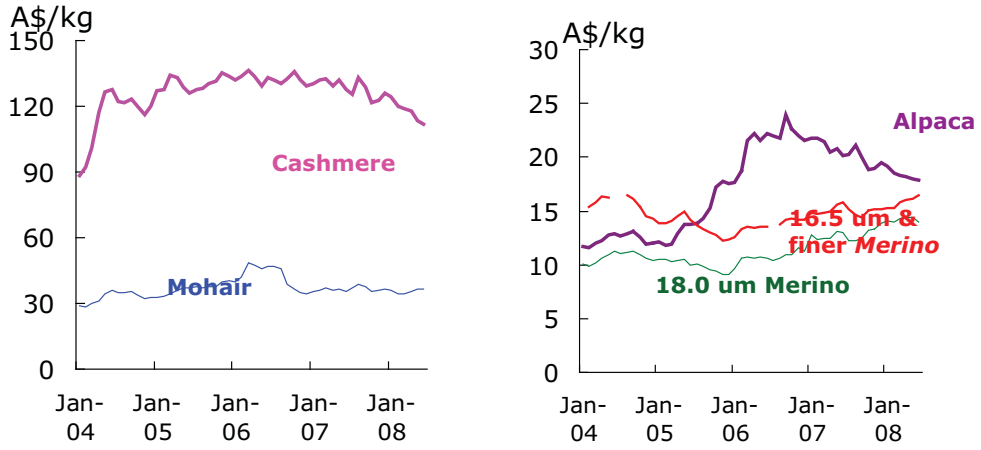
The result is an example of a better outcome in terms of performance, functionality and environment :i.e. in the LCA study after purchase care could be a big part of our 'footprint'

Very strong demand for this functionality in key Asian markets

Currently **transferring the technology** to, Sunshine (China), Raymond's (India). Strong interest from large retailers such as Hugo Boss etc.

Along with Apple's ipod, the Shower Suit was one of the best and most recognised innovations in Japan consumer surveys in 2008.

Luxury Natural Fibre Prices: Merino and others Monthly



The Australian merino fibre is facing a number of challenges…

On the whole, fashion has moved against wool. Apparel categories where wool has traditionally had a high share have shown limited or negative growth, while the apparel categories that have exhibited the highest growth have very low wool share.

Consumer trends have also moved towards lighter garments, and this has resulted in a smaller quantity of wool used in garment production, even for 100 percent wool garments. The increasing availability of air conditioning and central heating in homes, offices, and transport has led to the increasing popularity of trans-seasonal clothing, which has a negative impact on many of the traditional uses of wool, such as heavy overcoats, heavy sweaters, blankets, and heavy men's suits.

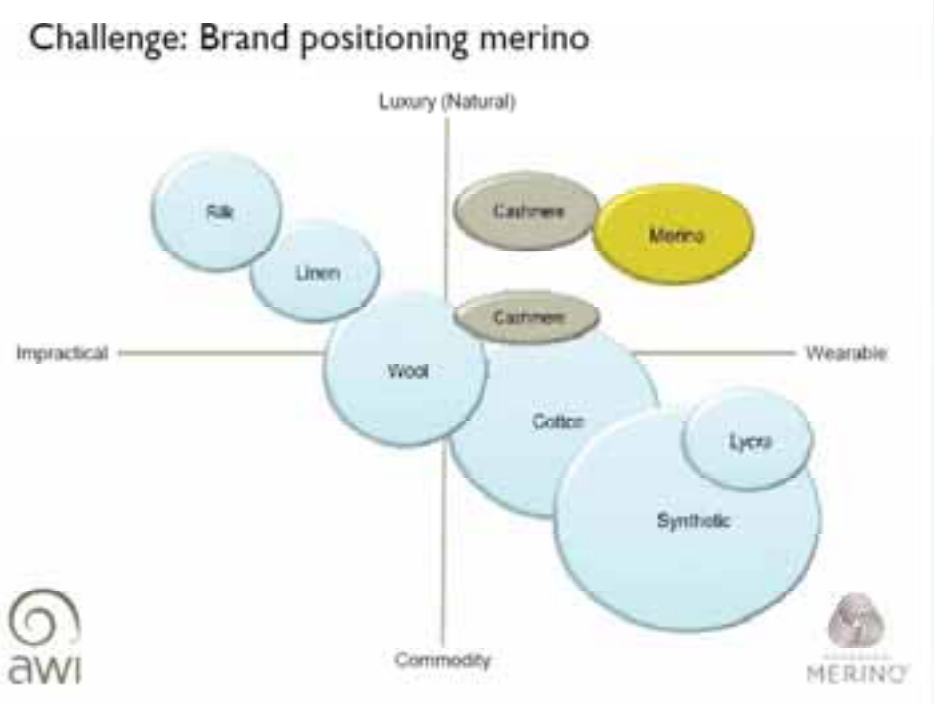
Consumers indicate that the three most important buying criteria are 'comfortable', 'available in casual styles', and 'for all seasons'. Wool currently rates poorly on all three attributes. At the other end of the spectrum the two strongest associations with wool are 'keeps you warm' and 'itchy or prickly' which, unsurprisingly, are rated extremely low as key buying attributes. On a more positive note, consumers strongly associate wool with 'natural' and 'high quality' and these are relatively important buying attributes.

The single most critical driver to improving the wool industry's profitability is to stimulate demand for wool apparel. Stimulating demand for fine and superfine wools should be the goal, given that Australian wool production has been increasingly focused on these wool types (60 percent increase over last 10 years). Australian wool farmers dominate this market with approximately 90 percent of global production of superfine wool (less than 19 micron).

Challenge: Brand positioning merino

The market has presented us with an opportunity. There seems to be no end to the inelastic demand for luxury. But as Cashmere continues to becomes less consistent and cheaper at retail, Australia's Merino wool will take this high ground. Australian merino has a lot going for it:

- Natural fibre
- Renewable source of clothing



- Able to be worn next to skin
- Ultra high "natural" performance owing to millions of years of evolution
- A fibre grown to protect a mammal
- Natural moisture management
- Natural luxury
- Traceable to every farm
- Environmentally aware fibre- i.e. impacts and processing highly developed to be ecologically sound. Our environment and ecology is delicate, very dry
- Biodiversity is a key
- Animal welfare is the basis of our industry's livelihood

AWI are also the owners of the iconic Woolmark brand. A brand that has appeard on over 2 billion garments since 1964. As part of our programme to continue to promote quality and wool via this universally recognised brand AWI are reinventing the Woolmark so that it means not only a quality product but also a quality process in terms of its environmental and social attributes.

So innovation does not just happen with products but also with the supply chain from farm to fashion so to speak.

As the economy changes, as competition becomes more global, it's no longer company vs. company but supply chain vs. supply chain. **— Harold Sirkin, 1994.**

Great firms will fight the war for dominance in the marketplace not against individual competitors in their field but fortified by alliances with wholesalers, manufacturers, and suppliers all along the supply chain. In essence, competitive dominance will be achieved by an entire supply chain, with battles fought supply chain versus supply chain. **— Roger Blackman, 1997.**

Utilising our network and licensee base introducing such a standard is a way wool textiles can reduce their impact on the environment.

AWI Corporate Social Responsibility Code of Practice for Woolmark licencees

- Confidence for retailers in regards how the
  - Environment
  - Chemical
  - Ethical labour
  - Traceability

One of the key components of this strategy is a fibre first: an environmental and social standard for wool textile processing.

INITIAL POSITION

The market actually requires more and more engagement of manufacturers in Corporate Social Responsibility (CSR). The AWI licensees are operating worldwide and partly in countries classified as risk countries concerning environmental protection and social responsibility. Furthermore the increasing pressure on retailers causes the importance of acting responsible in these areas.

More and more consumers are considering environmental and ethical aspects in their buying decision.

Media and non-governmental organisations are increasing pressure to improve working conditions particularly in developing countries and emerging markets.

AWI intends to provide its licensees with sustainable management solutions within the Merino supply chain leading the participating companies to a premium level of product quality, environmental and social top level compliance with global requirements. The licensees shall have the ability to meet laws, directives (e.g. REACH/RoHS etc.) and customer specifications based on a proactive approach.

The final goal should be a premium signet under ethical and sustainable principles.

The CSR mission statement:

"The Woolmark Australian Merino brands mean more than just premium quality, they mean the product exceeds ethical and environmental best practice from the Australian environment to the consumer. Consumers will buy Australian Merino for two reasons: for themselves and for the environment"

ALMS

1. The Eco- smart consumer notes that this "Onward" suit costs the same as other but $5 goes towards an environmental initiative

2. Consumer buys the product and Onward send US$ 5 to AWI, a non-profit R & D marketing company for wool in Australia

3. AWI distributes 100% of the collected funds to programs aimed at developing and improving the environmental management systems (EMS): the Bestprac group in pastoral areas and ALMS, a non-profit EMS certification provider

4. Bestprac and ALMS develop environmental and sustainability programs.

Underpinned by ISO 14001 certification and national level data on improved environmental conditions

5. Three winners.
1. Consumer has a US$ 400 suit and has contributed to the improvement of the environment where the fibre for his garment came from.
2. The wool grower has funding and help to improve his natural surrounds and to improve and sustain his activity
3. The earth

AWI works in a number of markets, this gives us a unique ability and reach.

For example another supply chain initiative includes linking a Japanese brand Onwards to the Australian farming community. Onwards have contributed money towards developing on-farm best environmental practices. In this case Australian Landcare Management

Systems (ALMS).
Onwards utilised AWI's non-profit status to contribute 10 million Yen directly to extension work in the Australian Outback.

AWI also works on sustainability in other wool growing countries. For example: wool harvesting expertise transfer to remote and pastoral China peasant households: 2006-09

From 2006 to 2009 AWI worked with the Chinese and Australian government agencies and local companies to improve the returns for Chinese peasants via better wool harvesting methods.

AWI also donated blankets during the aftermath of the terrible Sichuan earthquakes in April 2008 which claimed the lives of 80,000 people and left many more homeless.

FUTURE CONSUMERS

The Merino dichotomy: tradition and evolution, youth and beauty

- One of the earliest depictions of a Merino. "El Buen Pastor" (The Good Shepherd) circa 1650 by Murillo (Spain)
- One of the latest knitwear pieces on a catwalk in New York. circa 2008

Fibre use trends

Looking forward, the market picture is challenging for wool and for other fibres.

Growth in the consumer market for textiles is slowing in both developed and developing countries.

Consumer spending per capita is moving away from clothing to housing, transport and education.

When apparel is purchased, consumers and retailers want better value in terms of price and quality.

New synthetic fabrics are competing on both lifestyle performance and cost points.
Major influences on demand for apparel textiles and wool into the 21st century have been identified:

The global apparel market is projected to grow at 2.5 per cent per annum - below the rate of expected four per cent world GDP growth.

The largest clothing sector will continue to be casual leisurewear (70 per cent) though its share will decline a little as 'smart casual clothing', sports apparel and active leisurewear segments develop.

Overall, the consumer wants it all. Key Apparel Purchase Drivers are no longer fashion designers but practical consumer demand for:

- Casual looks - relaxed, less structured but not cheap or uniform fabrics
- Comfort - looser fit, lightweight, soft handle, breathability and stretch
- Clothes that travel well - wrinkle resist, durable
- Convenience - total easy care
- Versatility - multi-occasions, seasons, individuality
- Value for money - a genuine product difference or a cheaper product
- Lifestyle brands - especially for young people, with confirmation of 'branding' as a global trend.

Retail consolidation with the aim of forcing economies of scale, and so lower margins and consumer prices, will increase buying pressure on apparel. Prices will continue to fall in real terms for many basic apparel categories.

The textile supply chain will have fewer players with access to consumers and more emphasis on value for money, product innovation, exclusivity, strategic alliances for co-operative product development, linked international expansion, global sourcing and promotion.

Pressures on wool prices and costs will continue, with ups and downs. The forces reducing prices paid for apparel and textiles include: - consumer spending choices away from clothing, consumers seeking best prices, oversupply of fibre and excess processing capacity, retail competition, global manufacturing competition locating into lower cost countries, and falling trade barriers for suppliers and markets.
Price and product demands are eroding the market share held by natural fibres. Greater economies of scale and industrial investment in new technology for synthetic fibres - polyester, acrylic and nylon - have enabled volume growth through price discounting, particularly in Asia

Future consumers

Young people dominate discretionary apparel expenditure globally. Young adults stress price and performance rather than textile fibre. They associate natural fibres with quality, but branded 'performance' products are further increasing the appeal of man-made fibres

(Tencel®, wool-like Polartec®, Lycra®).
Younger adults have high regard for wool quality, softness and breathability - however 50 per cent see wool as difficult to care for and 42 per cent think wool apparel is itchy.
Both consumers and retailers perceive that wool is used for formal wear and classic knitwear for older people.

AWI invests in the development new wool blends, fabrics and textiles to address these consumer concerns.

Product pricing will continue to influence younger and older consumers, retailers and pipeline businesses with the option to use fibre alternatives. Wool is an expensive fibre to produce and to process compared to cotton or synthetics.
AWI is committed to research, development and innovation that will reduce costs and improve production efficiencies at each stage of the global wool pipeline.