# A Scoping Study into the Current and Potential Future Use of Sheep Coats

**Project EC691**

**Public Report to AWI**

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# 1. Key Findings (Executive Summary)

This Scoping Study conducted during late 2003 and early 2004 provides a brief examination of technical (existing practices, supply, performance and issues), commercial (impact on raw wool characteristics and processing performance) and economic (impacts on wool price and costs and benefits) issues in relation to the practice of coating sheep.

This abridged version is taken from a Final Report which was initially submitted to AWI in February 2004 and updated in September 2004.

The primary objective of this study was to assist AWI to determine their R & D investment strategy, if any, for sheep coats.

The study involved:

- Reviewing previous scientific research to identify the impact of sheep coats on raw wool characteristics; sheep health; and the processing performance of wool;
- Reviewing economic data (both scientific studies and anecdotal information) to identify the possible costs and benefits of using sheep coats;
- Undertaking a high level macro-economic overview by analysing Australian wool sale statistics to assess the potential for an expanded use of sheep coats across the Australian clip; and
- Interviews with industry to examine current practices and to identify issues that may require further research.

## Key Findings

Key findings from this study were:

1. Up to 100,000 sheep Australia wide may have been coated per annum over the last couple of seasons. Most coats are made from nylon and these are predominately imported from China and then distributed through a range of suppliers. Few coats are now manufactured in Australia.
2. On average, the annual cost of coating is in the vicinity of $6 per head per annum (although this is variable).
3. While scientific research has helped identify the impact of coats on raw wool quality and processing performance, differences in trial design make direct comparisons somewhat difficult and results variable.
4. Nevertheless, the use of coats (particularly for a full 12 months of wool growth) does appear to consistently improve Style (by at least one grade); VM (usually down to 1% or less - FNF) and Yield.
5. There is also some evidence from previous research (and particularly from anecdotal evidence) that coating of sheep can provide a net financial return to woolgrowers. However, the true commercial return from coating sheep is not well documented and is based on “variable” analysis methodologies and a limited number of observations.

6. Examination of recent Australian Wool Sale statistics would suggest that the improvement in style and VM of the coated component of fleece wool is likely to financially benefit the following wool types:
    - The majority of fleece wool less than 17.5 micron;
    - The majority of fleece wool in the range of 17.6 to 18.5 micron and with VM levels of 2% to 4%;
    - A significant proportion (perhaps 50%) of fleece wool in the range of 17.6 to 18.5 micron and with VM levels of 1% to 2%;
    - A small proportion (perhaps 10%) of fleece wool in the range 18.6 to 19.5 micron with a VM level of 1% to 4%; and
    - There is also the possibility that fleece wool above 19.5 micron which carries in excess of 4% VM will benefit, but the likelihood would appear to be low.
7. Based on a range of assumptions, the above broad macro-economic analysis would suggest that:
    - a high proportion of woolgrowers producing superfine and fine wool could financially benefit from the use of sheep coats. The potential market for coated sheep may be in the vicinity of 0.6 million to 1 million sheep per annum (or 200,000 to 330,000 new coats per annum) assuming a 20% adoption rate from a maximum market of 3 - 6 million sheep. This represents a potential growth of up to 10 times the current usage; and
    - a net financial return to woolgrowers (after coating costs had been included for approximately 1 million sheep) may be in the vicinity of $2.15 million.
8. Geographical target areas were assessed and these are, as expected, the areas where fine wool sheep are grown.
9. To achieve the potential growth in the market, there are several issues which if addressed would assist. These include;
    - The quality of the coat is not always fit for purpose, particularly in relation to inconsistent fabric quality and UV stability; shape retention; loss rate; ability to adjust the coat over time to cater for animal and wool growth; and ease of application and removal;
    - There is a lack of robust costs and benefits associated with coating sheep; and
    - There is a lack of consistent extension information about the types of sheep which may benefit from coating and the associated costs.

On the basis of this Report, a series of recommendations were provided to AWI for consideration.

# 2. Introduction

The coating (or rugging) of sheep to improve wool quality and animal welfare has been practiced in Australia for over 70 years. Since that time, interest in coats has ebbed and flowed, often associated with the strength (or otherwise) of the wool market and relative premiums and discounts for various raw wool characteristics.

More recently there has been renewed interest in the costs and benefits of using coats on sheep. The drivers of this would appear to be:

- The strength of the wool market in 2002 and early 2003, particularly the high premiums for fine wools and better style (This reduced over the subsequent 12 months and has since moved again).
- Specialist woolgrowers seeking to extract the maximum value from each animal they run by maximizing the quality of the fibre produced
- The use of coats by "shedded sheep" woolgrowers
- Interest from coat manufacturers and coat suppliers to promote their products.
- Interest from researchers to identify new methods to enhance woolgrowing operations via improving wool quality and consequently attract research dollars.
- Interest from some specialty wool exporters.

Studies into the advantages of using coats on sheep have a long history in Australia with the earliest studies dating back to the 1940's[1].

In 2003, AWI had several representations (and project proposals) made in relation to further research into the issue of sheep coats. As a result, AWI sought a more in depth analysis of the current and potential market for sheep coats so as to provide an input into their deliberations on what, if any, issues may require further research.

# 3. Background

## *3.1. The Objective*

The overall objective of this Report was to:

**"Review previous work and examine current issues and practices so as to assist AWI to determine their R & D investment strategy in relation to sheep coats".**

[1] Montgomery and Bulmer (1942)

### 3.2. Project Scope

The Scope of this project was to briefly examine all technical, commercial and economic issues in relation to the practice of coating sheep. This included:

1. The impact of sheep coats on raw wool characteristics; animal health; and wool processing performance;
2. The supply of coats and their performance in the field;
3. The costs and benefits of using sheep coats; and
4. The identification of issues surrounding the use of sheep coats which may warrant further research.

### 3.3. Project Methodology

This review was undertaken from November 2003 through till February 2004. A revision of the Report was undertaken in September 2004. The methodology used was:

1. A review of previous scientific research in the area of sheep coats to identify the impact of coating on raw wool characteristics, sheep health and the processing performance of wool.
2. A review of economic data from all sources (both scientific studies and anecdotal information) to identify the possible costs and benefits from using sheep coats across a range of sheep types and geographical areas.
3. Conduct of a high level macro-economic overview by analysing Australian wool sale statistics to assess the potential for an expanded use of sheep coats across the Australian clip.
4. Undertake face to face meetings and phone conversations with key growers, wool buyers, coat manufacturers and researchers to obtain their views about the coat market; to examine current practices; and to identify issues that may require further work. Face to face meetings were held in Western Australia, New South Wales and Victoria.

## 4. Scoping Study

### 4.1. Current Status of the Sheep Coat Industry

It is difficult to obtain a clear picture of the current status of the sheep coat industry in Australia as there is no central registry of users or suppliers (nor does their need to be one). Additionally, wool sold from coated sheep is not identified in sale catalogues

thus it is not possible to analyse wool sale statistics to obtain a clear picture of their use or impact on wool prices.

### 4.1.1 Grower Use

From the qualitative interviews conducted with a number of growers, buyers, manufacturers and researchers, the following observations are made in relation to the current use of coats by woolgrowers. As these consultations involve only a small segment of the industry these observations should be treated with caution. In addition, some suppliers (and some growers) were also understandably reluctant to divulge certain aspects regarding their commercial operation.

1. While there is no clear view as to the current size of the sheep coat market, many consider (anecdotal) that up to 100,000 sheep might have been under coats Australia wide per annum over the last couple of seasons. If anything, given the weaker state of the wool market, this number may have reduced during 2003, although would appear to be moving back in 2004
2. Perhaps half of this number is located in the Traprock and surrounding regions of Queensland and northern NSW. The remainder tend to be scattered across several States with some key "pockets" of use being in NSW (Tableland fringes and some Western areas), Victoria (Western District, Gippsland and Central Victoria), and WA (South East).
3. "Shedded" sheep are also an important market for sheep coats.
4. All woolgrowers use coats to seek improvements in the quality of their wool and/or sheep and thus make a financial gain from the practice. The predominance of use is on sheep less than 20 microns. In many areas, sheep from within a mob are specially selected for quality attributes (fineness and style) prior to coating i.e. not all sheep in the mob are coated. This is especially the case where growers and/or their sheep classer have had considerable prior experience in using coats. In many flocks, only the hogget's may be coated to extract maximum value from these finer animals of the flock.
5. There would appear to be three main woolgrower segments of the sheep coating market (the last two of which are unlikely to be mutually exclusive) who are seeking to obtain the maximum value of their wool by using coats;
    a. Shedded sheep.
    b. Those seeking to generally improve the quality of the wool (style and VM levels in particular) from paddock run sheep in dusty, predominately native pasture environments; and
    c. Those who are using coats to move a proportion of their clip into the "specialty market" from paddock sheep run in environments where specialty wool would not be possible without the use of coats (i.e. moving from "Topmaking" styles into "Spinners", and better styles. Under the AWEX style classification this would be akin to moving from MF 4, 5, 6 to MF 1, 2, 3 or an ASF type).

6. Some growers also reported the use coats as an aid to improve animal welfare and health including;
    a. Protection of animals from inclement weather – especially when "off-shears" or recently shorn;
    b. As an aid to enhance weaner thrift;
    c. Reducing the prevalence of fly strike and/or fleece rot in some areas
7. There is a wide range of woolgrower preferences in relation to coat design (e.g. long or short coats; strapping); method of application (e.g. race; pens; VE machines); and timing of application (12, 10 or 6 months). Coat application and removal is difficult and labour intensive. Growers have developed their own method to suit themselves and their available labour. Some use a VE machine. Others who apply and remove coats manually do so either in a race or small pen. For coat usage to increase, easier ways of application and removal are needed.
8. Grower's use of coats can be best described as either strategic or tactical.
    a. **Strategy 1** – Constant use for shedded sheep.
    b. **Strategy 2** - Apply the coats off shears. Keeping coats on bare shorn sheep was reported as a difficulty. Coats are usually either adjusted or replaced (at least once) by a larger coat over the 12 months as wool (and sheep in younger animals) grows. Some more recently developed coats are size adjustable. This strategy maximizes wool quality.
    c. **Strategy 3** – Apply coats when sheep have approximately 2 months wool growth. Usually done where shearing does not coincide with high dust and VM problem to minimize impact on wool quality. Reported as requiring less maintenance of coats and animals than Strategy 2 above.
    d. **Tactical** – Apply coats for approximately 6 months to coincide with highest dust and VM risk e.g. apply coats to cover Summer and Autumn. This strategy increases coat "life" and reduces monitoring and the necessity to change coats to accommodate wool (and animal) growth. However, some reduction in wool quality is likely depending on the geographical area.

### 4.1.2 Coat Suppliers

The number of companies supplying the sheep coating market has varied over time. Key points of note in relation to coat supply are:

1. Most coats are now imported from China in a fully finished or semi-manufactured state. Most local companies primarily act as distributors, although many apply finishing touches to the coat.
2. While most coats are now made from nylon, some polyethylene coats are still sold, predominately to the shedded sheep market.
3. The fabric type and UV stability was reported as being quite variable in the past. Obtaining consistent fabric was also reported as being a difficulty from

time to time, especially as some fabric manufacturers have limited testing laboratories on-site.

4. There is a very active market in terms of coat design. It would appear that all suppliers are constantly refining their coat design to better meet their customers' requirements.
5. The necessity for suppliers to hold in stock a range of sizes was reported as an impediment for some suppliers.
6. The market is very price sensitive – in late 2003 / early 2004 it was considered that most nylon coats need to retail for approximately $7.

The following table provides a listing of those organisations who are believed to be commercial suppliers of sheep coats.

| **Company (State)** | **Contact** | **Phone & Email** |
|---|---|---|
| | | |
| **Wool-Overs (Queensland)**<br><br>Brent & Margie Findlay | "Cooinda",<br>Dalveen'<br>Qld, 4374 | Phone:<br>07 4685 7100<br>Mobile:<br>0428 857 100<br>margie@wool-overs.com.au |
| **bcs Agribusiness Solutions**<br><br>Ben Swain | "Gartmore",<br>Gunnedah, NSW, 2380 | Phone:<br>02 6743 2306<br>Mobile:<br>0427 100 542<br>ben_swain@bigpond.com |
| Glen Adams | 335 Linton Naringhil Rd,<br>Linton,<br>Victoria | Phone:<br>03 53447337 |
| **Pearl Village**<br><br>Susan Song | 1 Dress St,<br>Mill Park<br>Victoria, 3082 | Phone:<br>03 9436 5988 |
| **Jumbuck Aust Pastoral Company**<br>Chris Porter | TWG,<br>Bathurst.<br>NSW | Phone:<br>02 6331 3244<br>Mobile:<br>0428 457 485 |
| **Sheepcovers Australia**<br><br>Noel Stansell | Sydney, NSW | Phone:<br>02 9949 3200 |
| | | |

## 4.2. Previous Research

Over the last sixty years there have been various studies into the impact of coating (or "rugging") sheep. The more recent research into sheep coats is summarized in Sections 4.2.1 and 4.2.2.

By way of introduction to this brief review of previous research, it is apparent that while several consistent effects are shown, other results are more variable in nature (for example, the impact on staple length or sheep liveweight). It is likely that such variability in results arose from differences in timing and aspects of trial methodology including:

- Changes over time in relation to the type of coat used – fabric; design; coverage etc
- Differences in seasonal conditions and the impact of this on the resultant wool quality and more particularly animal health (e.g. fleece rot and fly strike);
- Differences in wool characteristics – especially micron – which had a significant impact on the financial benefits reported;
- Differences in accounting for costs, especially labour.
- Trial management variations including:
    - whether coats were closely monitored and replaced if lost or badly damaged; and
    - what components of the wool were segregated (classed out) and compared for raw wool quality attributes or processing performance, e.g.
        - The covered component versus the remaining fleece wool from coated sheep (but not covered by the coat) versus uncoated fleeces;
        - The fleece component (covered and not covered) versus non coated fleece wool – i.e. skirtings removed on both occasions; or
        - Whole fleeces (including skirtings) from sheep that were coated versus non coated sheep.
- The manner in which sheep were (or were not) randomized prior to trials so as to ensure that differences between coated and non coated sheep were reflections of the coat and not some difference between the animals in each group.

Such differences in trial design make direct comparison of trials undertaken over a period of years difficult.

### 4.2.1. Technical – Raw Wool Characteristics

Table 1 provides a brief summary of the impact of coats on raw wool characteristics observed from trials undertaken over recent years. Ford and Cottle (1993) provide a brief history of previous sheep coating research and the impact on raw wool quality and processing performance.

The studies reviewed were:

- Abbott (1978).
- Ford (1994).
- Hatcher et al (2003).
- Hogan & Campbell (2003).

**Table 1: The Effect of Sheep Coats on Raw Wool Characteristics**

| Trial Author | Trial Design | Impact on Raw Wool Characteristics (Coated versus Non Coated) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sheep Live Weight | Clean Flc Weight | Fibre Diameter | VM | Yield | Style | Staple Length | Staple Strength | Fleece Rot | Fly Strike | Weather-ing & Dust | Other |
| **Abbott** | Coated and uncoated sheep compared on six properties in NSW, Vic and SA. 21 to 26 micron. RWC's measured in top. 40 to 90 sheep per trial. | NS | **Pos** Increase of 0.05 to 0.1 kgs. | **Pos** Small change only - 0.2 to 0.4 | **Pos** VM in top reduced by one-third | **Pos** Large increase in yield. 1% to 9% | NR | NR | NR | Generally reduced | Generally reduced | 3% to 5% of fibre lost from tips | |
| **Hatcher** | 11 bloodlines run in NSW. 6 superfine, 3 fine and 2 medium. 15 sheep per trial. 10 month coated | NR | NS | NS | **Pos** 0.5% reduction | **Sig Pos** 4.3% | **Pos** One style grade | **Sig Pos** 4 mm | NS | NS | NS | **Sig Pos** | High loss rate of coats - esp. medium sheep |
| **Ford** | Two years. West NSW. Fleeces matched on Ha and Micron. 360 sheep total. 17 to 21 micron. Estimated technical value of fleece. | NR | NR | NA | NS All FNF | **Sig Pos** | **Pos** One style grade | **Pos** | NS | NR | NR | **Sig Pos** | |
| **Campbell** | Commercial trial. 6 flocks. 4 x 6 months. 2 x 12 months. 17 to 20 micron. Some trial anomalies | NS | NS Some increase for 12 months. | NS | **Sig Pos** 1.3% for 6 months and 2% for 12 months% | **Sig Pos** 11% | NR | NS | NS | **Sig Pos** Reduced from 11% to 2%. Higher for 12 months | NR | **Sig Pos** Dust reduced | |

| Key | | | | |
|---|---|---|---|---|
| | **Sig Pos** | Significantly positive impact e.g. increased SS | **NS** | No significant change |
| | **Sig Neg** | Significantly negative impact e.g. increased micron | **NR** | Not reported or measured |
| | **Pos** | Positive impact but significance not reported | **RWC** | Raw wool characteristics |
| | **Neg** | Negative impact but significance not reported | | |

The major points identified from this and previous reviews of the literature are:

1. There is no doubt that some raw wool characteristics are positively influenced by the practice of coating sheep, especially VM, yield and weathering. In environments where VM is an issue, VM levels can be reduced to "Free or Nearly Free" (FNF) levels (less than 1%) for sheep coated for 12 months. Where coats are used more tactically (6 to 7 months) reductions in average VM are approximately 2%.
2. Where assessed, style is also positively impacted – usually improving by approximately one style grade on average.
3. Where there is a prevalence of fleece rot (and perhaps also fly strike) there is some evidence to suggest that the use of coats has a positive impact on these animal health issues, but this is obviously area (environment/climate) and sheep type dependant. However, all researchers note the importance of vigilance in regular monitoring of sheep under coats to ensure any fly strike is quickly identified (especially around leg straps where rubbing and subsequent strikes can occur).
4. Other raw wool characteristics are far more variable in their response. Mean fibre diameter, staple length, staple strength, clean fleece weight and sheep liveweight do not consistently alter from the use of coats. Results may be influenced by sheep type, environmental conditions and trial design.
5. The impact of sheep coats on raw wool characteristics is also influenced by length of time coats are applied, although the relationship between the two does not appear to be linear. Time of application and use, time of shearing, region and climatic factors will impact on this relationship (i.e. use of coats during the time of year when dust and VM contamination is highest).
6. Loss rate of coats varies and has been observed to be higher for medium micron sheep, although it has been reported that some of this incidence was as a result of coats becoming too small for larger sheep and causing rubbing and subsequent animal health issues.

### 4.2.2 Technical – Processing Performance

Table 2 provides a brief summary of the results of processing trials undertaken in recent years.

**Table 2: The Effect of Sheep Coats on Processing Performance**

| Trial Author | Trial Design | Impact on Processing Performance (Coated versus Non Coated) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Card Losses | Romaine (Noil) | Top and Noil Yield | Hauteur | VM specs in Top | Other |
| **Abbott** | Coated and uncoated sheep compared on six properties in NSW, Vic and SA. 21 to 26 micron. RWC's measured in top. 40 to 90 sheep per trial. | NR | **Pos** Approx. 1% reduction | **NS** | **Sig Pos** Averaged 1.7mm up to 7mm. | **Sig Pos** Reduced by one third | |
| **Hatcher** | Processing not examined | | | | | | |
| **Ford** | Two years. West NSW. Fleeces matched on Ha and Micron. 17 to 21 micron. Estimated technical value of fleece. | **Sig Pos** Approx 1% | **Sig Neg** 1% more | **Sig Pos** 2% to 5% | **NS** | **NR** | |
| **Campbell** | Commercial trial. 4 flocks processed. 3 x 6 months. 1 x 12 months. 17 to 20 micron. Some trial anomalies | NR | NS But some differences are very high. Average 6% | **Sig Pos** 15% increase | **NS** Usually 3 or 4 mm but one of 13mm | **Sig Pos** | Diameter of fibre ends in top not signif. different |

| Key | | |
|---|---|---|
| | **Sig. Pos.** | Significantly positive impact e.g. increased SS |
| | **Sig. Neg.** | Significantly negative impact e.g. increased micron |
| | **Pos.** | Positive impact but significance not reported |
| | **Neg.** | Negative impact but significance not reported |
| | **NS** | No significant change |
| | **NR** | Not reported or measured |
| | **RWC** | Raw wool characteristics |

Any reductions in "contaminants" in greasy wool (e.g. VM, dust etc) can be expected to reduce losses in carding and improve the quality of the top produced. Accordingly, the results of processing trials show that wools' processing performance can be positively affected by coating. However, for reasons outlined earlier, some variation in results is evident.

The major points identified from this and previous reviews of the literature are:

1. Card loses are reduced by coats, most likely as a result of reduced tip weathering and a reduction in VM
2. Romaine tends to be lower for wool from coated sheep and Top and Noil yield significantly increased, again as a result of improved raw wool quality.
3. The impact of coats on Hauteur was less consistent and may be a result of trial design. Implicitly it would be expected that the impact on Hauteur would be positive.
4. The reduced level of VM in the greasy wool also results in a lowering of VM impurities in the top.
5. In the only known examination (Campbell), the diameter of fibre ends did not significantly change as a result of coating.
6. Understandably, most work to date has concentrated on examining the impact of coating on early stage processing. There has been little work undertaken to

examine what, if any, improvements there may be in fabric characteristics. One area possibly not well covered by earlier studies involves the potential benefits to fabric comfort and evenness of dyeing arising from reduced tip weathering.

The results of processing trials show that the improvements in wool quality provided by coating are reflected in the processing performance of the wool and subsequent wool top characteristics.

### 4.2.3 Economic

Currently there is a dearth of robust economic data in relation to the costs and benefits of coating sheep.

Some research projects reviewed in Section 4.2.1 sought to estimate the costs and benefits but these usually involved limited numbers of observations; differed in the way in which costs were handled (if at all) or in the manner of valuing the wool; or were analysing mid to broad micron wools which were unlikely to show positive net results.

These analyses can be summarised as follows:

Abbott – examined mid micron wools (21 to 25 micron). Prices estimated (not auction prices). Raw wool loss of $ 0.83 cents per kilogram

Hatcher – Superfine, fine and medium wools run in western NSW. Prices estimated (not auction prices).Average gain of $ 0.60 cents per kilogram

Campbell – 17 to 21 micron. Prices established at auction. Gross price differentials of $ 2.45 loss to $ 8.51 gain but a query on the data.

During the course of this review, wool sales were visited where coated wools were offered for sale. In addition, AWI has received several individual clip auction sales results showing the positive impact of coats. Some of these are reproduced in summary form below. Note: these results should not be taken as indicative, but of what may be possible.

| Sale Date | Coated or Uncoated | Micron | VM | Yield | Clean Price | Difference |
|---|---|---|---|---|---|---|
| Aug 2002 | Coated | 17.0 | 0.2 | 81.1 | 2785 | **635** |
| | Uncoated | 17.1 | 1.5 | 71.5 | 2150 | |
| Sept 2002 | Coated | 16.9 | 0.5 | 79.2 | 3442 | **1048** |
| | Uncoated | 17.0 | 1.0 | 74.3 | 2394 | |
| Sept 2002 | Coated | 17.4 | 0.3 | 80.6 | 2780 | **787** |
| | Uncoated | 17.4 | 0.7 | 75.8 | 1993 | |
| Nov 2003 | Coated | 16.1 | 0.2 | 80.2 | 1600 | **590** |
| | Uncoated | 16.1 | 0.7 | 74 | 1010 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Nov 2003 | Coated | 16.6 | 0.1 | 74.8 | 1700 | **919** |
| | Uncoated | 16.8 | 0.9 | 68.7 | 781 | |

Some of the observations (not conclusions due to the lack of information about costs and benefits) that can be drawn from the above very brief analysis and discussions held during the course of this review are:

1. There is a real lack of robust data in relation to the true costs and benefits of coating sheep.
2. What data does exist, has generally been based on estimated or modeled prices and not market prices established by the wool buying trade. This is a significant limitation as trade prices are the true measure of value.
3. Previous research paints a relatively marginal (at best in some cases) return on investment from using sheep coats. Indeed, if all costs were accounted for in the research examined a loss rather than a financial gain would have been the usual outcome.
4. Sale results provided by individual growers combined with observations made at wool sales (Newcastle, 2002 and 2003) indicate strong evidence of premiums for coated wool. Observed premiums for some wool ranged up to $10 per kilogram clean. Obviously such data only involved one on one comparison and thus needs to be treated with a degree of caution.
5. These “sale data” observations were reinforced by conversations with some members of the wool buying trade and with other woolgrowers.
6. Certainly, low fibre diameter (18 micron and finer) would appear to be a key requirement for a positive financial outcome.
7. The use of coats to move wool from a Topmaking style to a specialty style (MF3 and above or ASF) would also appear to be important for a positive financial gain.

There are a range of other potential benefits that were identified by growers during the consultation phase of this study. These included:

- A reduction in fly strike and fleece rot (studies indicate this may be the case in prevalent areas).
- Improved value of sheep skins from coated animals (this is unlikely to be the case as superfine/fine wool on skins is usually fellmongered).
- Improvements in wool colour (some data on this).
- Enhanced weaner thrift as a result of the protective nature of the coat (no studies have examined this aspect).
- Less classing out of lower grade lines. Coats protect the backs and necks which are often wools which are classed out and receive a lower price than the rest of the fleece wool, especially in superfine clips.

## 4.3 The View of Industry – Market Survey

As noted in the Methodology, face to face interviews and telephone conversations were conducted to seek industry experiences and to identify issues.

Based on these discussions, it is apparent that woolgrowers use coats for a variety of purposes – although all obviously relate to securing a net financial gain from wool sales or a sheep management benefit. Many growers interviewed are quite passionate about their use of coats and see their use expanding considerably. Others have tried them on one or more occasions and are unlikely to use them again until premiums for micron, style or VM increase significantly. The shedded sheep industry is an important market for sheep coats as growers seek to produce the highest possible quality in this specialty market. Some of the positive issues identified include:

- Improvements in wool style, VM, dust penetration and weathering/tip damage (and possibly other raw wool characteristics such as staple length and strength). This enables them to produce high quality wool that otherwise would not be possible in their environment;
- Reduced likelihood of fleece rot or fly strike in certain areas. This can have the added benefit of reducing chemical use and perhaps opening new "environmentally friendly" marketing opportunities;
- Can protect the animal from heat stress in summer and cold/wet conditions in winter improving animal well-being.
- Surprisingly few problems in crutching, mating or lambing coated sheep.

The useable "life" of coats in the field varied enormously depending on fabric and environment. This was reported as ranging from 3 months to 5 years. PE coats used on paddock run sheep were often referenced as performing poorly.

While sheep coating practices vary between growers depending on a range of factors (previous experience, climate, environment, availability of labour, sheep age and type) there are some common issues that most woolgrowers and suppliers identified including;

- The quality of the coat must be improved, with many growers wanting a warranty on performance (largely longevity). Problems mentioned were:
    - Quality is inconsistent
    - UV stability in particular was seen as perhaps the single most crucial issue;
    - Many fabrics used were prone to tear or disintegrate easily (this was a criticism of most fabrics, especially some PE coats);
    - Elastic around the front and back tends to lose its effect quite quickly;
    - Adjustment straps often do not have the longevity required for reuse;
- Many growers and suppliers wanted a system put in place to "get rid of the "back-yarders" who were seen as giving the industry a bad name.
- Coats need to be adjustable to cater for wool growth (or for growth of the animal in the case of lambs or weaners/hoggets) throughout the year. Putting

coats on, adjusting them (or removing them and putting on a larger one during the year) and taking them off is very labour intensive and thus costly (although this cost is often not fully recognized or quantified). An easier way of adjustment and/or application or removal was desirable.

- "Size" changes were also a concern for suppliers as this required them to hold a large stock of various sizes to cater for customer needs.
- Coats need to cover the maximum amount of wool possible – long neck coats often being preferred by many.
- To achieve wider application, coats must be either cheaper to buy or last longer.

There was also a regularly made comment by woolgrowers that they needed more information about the costs and benefits of using coats. Many growers also said that it would be great if they could tap into other farmers experience so that they made the right decision in regards to when to use coats and what sheep to use them on.

## *4.4 Macroeconomic Analysis*

What could the future market be for sheep coats? And which areas are likely to benefit the most from their use?

While rubbery, it is estimated that in the vicinity of 100,000 sheep may have been "coated" in recent seasons. From interviews conducted, an often held view was that the potential annual market for sheep under coats may be in the vicinity of 1 million plus, a ten-fold increase.

To seek some further clarification in relation to these questions, an analysis was undertaken of Australian Wool Sale Statistics. Two seasons were selected and data was obtained from the Australian Wool Exchange (AWEX). These were

- 2002/2003 being, at the time of this analysis, the most recent season, but one which would show some impact on wool quality from the long drought experienced in Australia.
- 1999/2000 being a more "representative" season across Australia.

### 4.4.1 Estimated Costs of Coating Sheep

By compiling information from a range of sources, an estimate of the cost of coating sheep has been made in the table below (Note: this estimate is likely to have a relatively low precision)

| Activity | Cost per Head |
|---|---|

| | ($ per annum) |
|---|---|
| Coat Purchase[2] | 2.34 |
| Fitting | 0.60 |
| Adjusting | 0.33 |
| Removal | 0.45 |
| Replacement Coats[3] | 0.52 |
| Checking paddocks[4] | 0.45 |
| Mortality - sheep[5] | 0.70 |
| Opportunity Cost (@5%)[6] | 0.30 |
| Additional Costs[7] | 0.30 |
| **Total** | **$5.99** |

As mentioned, there is no doubt these costs could be queried. For example, in some instances mortality rate could actually reduce due the protective nature of the coat in inclement weather conditions.

For the sake of this exercise, it is also assumed that only finer wool sheep are likely to benefit from coating in the current market. For this analysis, we assume an average greasy fleece weight of 4 kg[8] for 17.5 micron wool with 70% covered by the coat and 30% not covered or removed as skirting. At 75% yield this equates to an average clean weight of coated wool of 2.1 kg.

Rounding the cost to $6.00 per sheep per annum and assuming 2.1 kg of "coated" wool, a woolgrower running 17.5 micron sheep would need to receive an additional $2.86 per kg clean to warrant coating animals. Assuming increased fleece weights for higher micron wools (2.6 kg clean for 19.5 micron and 3.2 kg for 21.5 micron), the break-even prices are $2.31 and $1.88 respectively. These are listed below:

| **Micron** | **17.5** | **19.5** | **21.5** |
|---|---|---|---|
| **Clean Weight of Coated Wool** | 2.1 | 2.6 | 3.2 |
| **Break Even Price Increase ($/kg clean)** | 2.86 | 2.31 | 1.88 |

### 4.4.2 Assumed Benefits from Coating Sheep

[2] Assumes coat lasts for three years and a purchase price of $7.00
[3] 7.5% per annum - average
[4] 3 days per annum @ 150 for 1000 sheep
[5] 1% above normal @ $70 per head
[6] Opportunity cost of money use at 5%
[7] Extra shed staff for skirting and higher selling costs associated with increased lines
[8] 4 kg may be on the high side.

On the basis of the previous analyses, it is assumed that coating of sheep may, on average, improve raw wool characteristics in the following manner:

- **Reduce VM levels in coated wools to 1% or less (**Free or Nearly Free (FNF)). This means a reduction in VM ranging from 1% to up to 7% or greater. (Note: it is assumed that all coats are worn for 12 months – which is currently not the case) and/or
- **An improvement of 1 style grade in "coated" wools**.

It must be noted that Style and VM are, in part, interrelated. For example lower VM wools are usually of better style. Therefore it is not strictly correct to assume that these two characteristics are mutually exclusive from one another.

Changes in mean fibre diameter, staple length and staple strength are assumed to be marginal from the use of sheep coats. There are also other benefits referred to in Section 4.2.3 (such as reduced fleece rot) that is not accounted for in this simple analysis.

Increased yield may also potentially impact on clean prices received for specialty superfine types. No analyses have been done on this issue although Woolmark (2004) reports that style and yield are highly correlated.

The break-even prices referred to in Section 4.4.1 were then compared to style and VM price differentials obtained from Australian Wool Sale Statistics (AWEX).

Only fleece wools were included in all the following analysis

In examining this data two points are noteworthy:

- **Using average wool prices is fraught with danger as it does not pick up the nuances that often occur in the market.**
- **Most importantly, elasticity of supply and demand is largely ignored. The existing significant price responses to improvements in Style in "speciality type wools" are for a fairly finite market. If there is a large increase in "speciality type wools" through the application of coats then such price responses are likely to reduce.**

### 4.4.3 Price Differentials for Style

Table 4 provides the change in average clean prices (c/kg) for **an improvement of one style category alone** (e.g. moving from MF5 to MF4), by micron categories, for the 2002/03 season. The areas highlighted show those wool types where the price differential resulting from an improvement of one style category from the use of coating may, by itself, achieve a net financial benefit (using the break-even prices in 4.4.1).

**Table 4 Average Price Differentials for Micron by One Style Category Improvement (2002/03)**
(cents per kg clean)

| Style Category | ASF Style Category (designated as A) | | | | MF Style Category (designated as M) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Style Change** | | **A2 to A1** | **A3 to A2** | **A4 to A3** | **M2 to A4** | **M3 to M2** | **M4 to M3** | **M5 to M4** | **M6 to M5** | **M7 to M6** |
| **Micron** | | | | | | | | | | |
| **15** | | | 3,073 | 1,682 | | | 952 | 1,185 | 1,299 | 356 |
| **16** | | 1,290 | 129 | 307 | | 1,702 | 865 | 545 | 667 | 176 |
| **17** | | 53 | 599 | 308 | | 1,025 | 560 | 407 | 392 | 99 |
| **18** | | | 54 | 153 | | 273 | 128 | 177 | 195 | 93 |
| **19** | | | | | | 48 | 46 | 86 | 104 | 66 |
| **20** | | | | | | | -8 | 52 | 56 | 69 |
| **21** | | | | | | | -23 | 38 | 31 | 45 |
| **22** | | | | | | | -21 | 33 | 15 | 55 |
| **23** | | | | | | | -55 | 31 | 21 | 46 |
| **24** | | | | | | | | 37 | 7 | 0 |

**Notes:**
Blank Cell = Insufficent Numbers to support the data
Columns - "M4 to M3" - average clean price change for that micron moving from Style MF4 to style MF3
- "M2 to A4" - average clean price change for that micron moving from Style MF2 to style ASF4
Coloured Cell - where the increase in price by the improvement in one style category covers the annual cost of coating sheep
Care should be taken in interpretation for some cells in low micron categories as few observations exist

It can be readily seen that in 2002/03, an improvement of one style grade alone is likely to result in a net financial gain for wool of 17.5 micron and finer.

Table 5 shows the same analysis for 1999/2000.

**Table 5 Average Price Differentials for Micron by One Style Category Improvement (1999/2000)**
(cents per kg clean)

| Style Category | ASF Style Category (designated as A) | | | | MF Style Category (designated as M) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Style Change** | | **A2 to A1** | **A3 to A2** | **A4 to A3** | **M2 to A4** | **M3 to M2** | **M4 to M3** | **M5 to M4** | **M6 to M5** | **M7 to M6** |
| **15** | | 5,836 | 3,874 | 1,973 | | | 2,818 | 2,517 | 2,159 | |
| **16** | | 2,719 | 805 | 663 | | | 2,159 | 377 | 589 | |
| **17** | | 1,364 | 405 | 367 | | 1,811 | 404 | 271 | 348 | 495 |
| **18** | | 305 | 233 | 137 | | 401 | 78 | 115 | 164 | -57 |
| **19** | | | 96 | 3 | | 103 | 9 | 27 | 102 | 199 |
| **20** | | | | | | 149 | 28 | 58 | 40 | 40 |
| **21** | | | | | | | | 26 | 18 | 40 |
| **22** | | | | | | | 2 | 11 | 9 | 6 |
| **23** | | | | | | | -5 | 4 | 2 | 5 |
| **24** | | | | | | | -19 | | 3 | |

**Notes:**
Blank Cell = Insufficent Numbers to support the data
Columns - "M4 to M3" - average clean price change for that micron moving from Style MF4 to style MF3
- "M2 to A4" - average clean price change for that micron moving from Style MF2 to style ASF4
Coloured Cell - where the increase in price by the improvement in one style category covers the annual cost of coating sheep
Care should be taken in interpretation for some cells in low micron categories as few observations exist

A similar picture emerges in that, considering an improvement of one style grade alone, only those wools around 17.5 micron and finer would almost certainly receive a net financial benefit from the use of coats. For wools 17.6 micron to 18.5 micron, some net financial benefits exist, primarily in the better style wools.

### 4.4.4 Price Differentials for VM

The results above are for an improvement in style alone, although we know that the use of sheep coats also lowers VM significantly.

While acknowledging the earlier point that style and VM are, in part, interrelated, an equivalent analysis was undertaken which examined the average clean price change **for reducing levels of VM alone**.

The assumption made for this analysis, as listed above, was that the use of coats for a 12 month period would reduce the level of VM of the "coated" portion of the fleece to 1% or less (FNF).

The results are shown below for 2002/03 (Table 6) and 1999/00 (Table 7). The areas highlighted show those VM levels where the price differential resulting from a reduction in VM from the use of coating may achieve a net financial benefit.

**Table 6 - Average Price Differentials for Reducing VM levels to 1.0% or less 2002/03 season (cents per kilo clean)**

| VM Levels | 2.0 to FNF | 3.0 to FNF | 4.0 to FNF | 5.0 to FNF | 6.0 to FNF | 7.0 to FNF |
|---|---|---|---|---|---|---|
| Micron | | | | | | |
| 15 | 810 | 1558 | 2005 | 2004 | 2215 | 2526 |
| 16 | 458 | 858 | 1043 | 1187 | 1248 | 1348 |
| 17 | 320 | 560 | 660 | 738 | 780 | 808 |
| 18 | 156 | 303 | 353 | 396 | 438 | 464 |
| 19 | 104 | 206 | 266 | 296 | 312 | 327 |
| 20 | 82 | 189 | 238 | 274 | 298 | 306 |
| 21 | 70 | 170 | 231 | 272 | 305 | 304 |
| 22 | 54 | 138 | 214 | 256 | 287 | 311 |
| 23 | 63 | 142 | 218 | 264 | 297 | 341 |
| 24 | 78 | 162 | 198 | 247 | 268 | 285 |

**Notes:**

Rows
- "2.0 to FNF" - average clean price change for that micron moving from VM of (1.1%-2.0%) to FNF (i.e. a 1% decrease)
- "3.0 to FNF" - average clean price change for that micron moving from VM of (2.1%-3.0%) to FNF (i.e. a 2% decrease)

Coloured Cell - where the increase in price by the reduction in VM covers the annual cost of coating sheep

Care should be taken in interpretation for some cells in low micron categories as few observations exist

**Table 7 - Average Price Differentials for Reducing VM levels to 1.0% or less 1999/00 season (cents per kilo clean)**

| VM Levels | 2.0 to FNF | 3.0 to FNF | 4.0 to FNF | 5.0 to FNF | 6.0 to FNF | 7.0 to FNF |
|---|---|---|---|---|---|---|
| Micron | | | | | | |
| 15 | 2235 | 3566 | 4343 | | | |
| 16 | 557 | 1050 | 1433 | 1521 | 1942 | 2031 |
| 17 | 305 | 585 | 775 | 841 | 935 | 1010 |
| 18 | 144 | 290 | 375 | 443 | 474 | 552 |
| 19 | 64 | 164 | 214 | 241 | 294 | 341 |
| 20 | 46 | 125 | 161 | 187 | 212 | 231 |
| 21 | 30 | 85 | 117 | 136 | 147 | 153 |
| 22 | 16 | 50 | 75 | 90 | 98 | 105 |
| 23 | 10 | 41 | 58 | 69 | 81 | 94 |
| 24 | 6 | 36 | 58 | 92 | 113 | 126 |

**Notes:**
Blank Cell = Insufficent Numbers to support the data
Rows - "2.0 to FNF" - average clean price change for that micron moving from VM of (1.1%-2.0%) to FNF (i.e. a 1% decrease)
- "3.0 to FNF" - average clean price change for that micron moving from VM of (2.1%-3.0%) to FNF (i.e. a 2% decrease)
Coloured Cell - where the increase in price by the reduction in VM covers the annual cost of coating sheep
Care should be taken in interpretation for some cells in low micron categories as few observations exist

For both seasons, VM has a significant impact on clean price. Comparing these price changes with the break-even price from the use of coats (section 4.4.1), the following conclusions can be drawn:

- For the superfine end of the clip (17.5 micron and finer), a reduction of just 1% in VM levels (e.g. from 2% to 1% or FNF) will result in a net financial gain from the use of coats. The net benefit obviously increases as the level of VM reduction (2%, 3% and so on) increases.
- For the fine component of the clip, (17.5 to 19.5 micron), a 1% reduction in VM is generally insufficient to cover the break-even price for coats. Larger reductions of at least 2% (and greater) is required.
- For middle micron wools (19.5 and above), reductions of 4% and greater in VM levels are usually required to “break-even” from the use of coats.

### 4.4.5 How Much Wool May Benefit From Coats

The above “simple” analysis examined the impact on price that may result from the use of coats through improved style OR reduced VM.

On the reasonable assumption that coating results in both style improvement and VM reductions for that component of the fleece under the coat, some way of combining the results from sections 4.4.3 and 4.4.4 is required. This becomes problematic as in practice style and VM are, in part, interrelated.

An estimate of the combined price effect from improvements in both VM and Style is shown in Section 4.4.6.

This section seeks to provide an “indication” as to the possible number of Merino sheep that could financially benefit from the use of coats. To do so requires

combining the financial impacts of both improving Style grade by 1 category and reducing VM levels to FNF. From the analysis in Sections 4.4.3 and 4.4.4, the following assumptions are made:

- The analysis is limited to fleece wools 19.5 micron and finer as:
  - The majority of wools in the range 19.6 to 21.5 would need to have an initial VM level of 4% or greater, plus an improvement in style. It is assumed that few woolgrowers with such levels of VM would accept the risk/reward scenario of coating sheep, especially given the additional work load involved in using sheep coats
  - Above 21.5 micron, only wool with VM levels well above 4% might benefit and such a net financial benefit would only be forthcoming in some years – those years where there was a large premium for VM reductions (style price advantages are usually small above 21.5 microns). Similar to the point above, it is suggested that few woolgrowers producing this sort of wool would accept this risk/reward scenario of coating sheep
- Wools categorized as ASF1, ASF2 and MF2 style have also been removed from the analysis as coating would not necessarily move such wools into a higher style category (other factors would be far more important). Additionally, this is a highly specialized section of the market and highly supply/demand dependent.
- Wools with VM levels of less than 1% and greater than 4% have been removed
- Wools less than 17.5 micron are very likely to achieve a net financial benefit from the use of coats.
- Wools in the range of 17.6 to 18.5 are almost certain to benefit if they have an initial VM level of 2% or greater, and probably most (say, 50%) if they have VM levels of 1 to 2%.
- Wools in the range 18.6 to 19.5 are almost certain to benefit if they have an initial VM level of 4% or greater, but only some (say 10%) if they have VM levels of 1 to 4%.

Based on the above assumptions and the estimated price premium required to provide a net financial benefit from the coating of sheep, Wool Sale Statistics for the two seasons (1999/00 and 2002/03) were again examined to identify what amount of wool might be available Australia wide which could benefit. These are shown in Tables 8 and 9. The Total Coated Bales column is calculated by using the following assumptions (note the highlighted colour in the text and tables):

- All (100%) wools less than 17.5 micron
- All (100%) wools in the range of 17.6 to 18.5 micron and with VM level of 2% to 4%
- Fifty percent (50%) of wools in the range of 17.6 to 18.5 micron and with VM levels of 1% to 2%.

- Ten percent (10%) of wools in the range 18.6 to 19.5 micron with a VM level of 1% to 4%.

Table 8 shows the number of bales of wool by micron category by Style category that have 1% to 2% VM and from 2% to 4% VM for 2002/03.

**Table 8 Micron x Style x VM for 2002/03 (number of bales)**
(Fleece wool only)

| | Style ASF | | | Grand | Style MF | | | | | | | Grand | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | | 4 | Total | 3 | 4 | | 5 | | 6 | | Total | "Coated" |
| VM % | 1 to 2 | 1 to 2 | 2 to 4 | | 1 to 2 | 1 to 2 | 2 to 4 | 1 to 2 | 2 to 4 | 1 to 2 | 2 to 4 | | Bales |
| Micron | | | | | | | | | | | | | |
| 16 | 201 | 887 | 8 | **1096** | 281 | 3,558 | 50 | 1,710 | 159 | 226 | 33 | **6,017** | **7,113** |
| 17 | 543 | 3167 | 33 | **3742** | 832 | 17,513 | 303 | 12,343 | 1,495 | 1,555 | 298 | **34,339** | **38,081** |
| 18 | 971 | 5656 | 29 | **6656** | 2,383 | 50,512 | 967 | 44,537 | 4,449 | 5,664 | 905 | **109,417** | **61,212** |
| 19 | | | | | 3,350 | 73,000 | 1,114 | 86,149 | 10,042 | 13,791 | 2,267 | **189,719** | **18,972** |
| Grand Total | **1,714** | **9,710** | **70** | **11,494** | **6,846** | **144,583** | **2,434** | **144,739** | **16,145** | **21,236** | **3,503** | **339,492** | **125,378** |

**Key** VM 1 to 2 = 1.0% to 2.0%
VM 2 to 4 = 2.1% to 4.0%
Total Coated Bales shows the no. of bales likely to benefit - MF & AF

100% likely to benefit
50% likely to benefit
10% likely to benefit

In 2002/03 there were over 339,000 bales of wool 19.5 micron and finer, carrying between 1% and 4% VM and within style MF 3 to 6. There was an additional 11,494 bales within the ASF style category, making a total of approximately 350,000 bales.

Using the assumptions shown above about wool types highly likely to benefit from coating, approximately 125,000 bales may have been in the “target market” in 2002/03.

Assuming the weight of bales averages 140 kg greasy (as fine micron wool), and at an average skirted fleece weight of 3.5 kg, this equates to 40 fleeces per bale and a theoretical maximum coat market of 5 million sheep (125,000 bales x 40 sheep).

Of the 125,000 bales of ASF and MF style wool, not all would be coated. Some will be low VM (near 1%); others may be cast lines; while in many cases it could be assumed that not all growers will want to use coats for a variety of reasons (labour, farm location, facilities, capital outlay etc). If a 20% adoption rate is assumed (fairly high), then this still equates to a market potential of approximately 25,000 bales.

These 2002/03 figures would suggest that the potential coats market may approximate 1 million sheep (25,000 bales x 40 sheep). Assuming coats last for an average of 3 years this could equate to over 330,000 new coats per annum.

Table 9 repeats the analysis for 1999/2000, probably a more representative year for the Australian wool clip (due to the drought in 2002/03).

**Table 9 Micron x Style x VMB for 1999/2000 (number of bales)**
(Fleece wool only)

| | Style ASF | | | | | Style MF | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | | 4 | | Grand | 3 | | 4 | | 5 | | 6 | | Grand | Total "Coated" |
| VM | 1 to 2 | 2 to 4 | 1 to 2 | 2 to 4 | Total | 1 to 2 | 2 to 4 | 1 to 2 | 2 to 4 | 1 to 2 | 2 to 4 | 1 to 2 | 2 to 4 | Total | Bales |
| Micron | | | | | | | | | | | | | | | |
| 16 | 136 | | 476 | 9 | **621** | 165 | | 736 | 27 | 111 | 10 | 2 | 1 | **1,052** | **1,673** |
| 17 | 888 | 2 | 4,050 | 37 | **4,977** | 971 | 8 | 7,851 | 270 | 1,575 | 226 | 23 | 13 | **10,937** | **15,914** |
| 18 | 3,357 | 2 | 16,863 | 255 | **20,477** | 4,085 | 9 | 41,683 | 1,771 | 12,265 | 1,650 | 489 | 70 | **62,022** | **43,128** |
| 19 | 3,217 | | 17,009 | 153 | **20,379** | 5,722 | 17 | 79,813 | 3,027 | 40,606 | 6,552 | 1,421 | 354 | **137,512** | **15,789** |
| Grand Total | **7,598** | **4** | **38,398** | **454** | **46,454** | **10,943** | **34** | **130,083** | **5,095** | **54,557** | **8,438** | **1,935** | **438** | **211,523** | **76,504** |

**Key** VM 1 to 2 = 1.0% to 2.0%
VM 2 to 4 = 2.1% to 4.0%
Total Coated Bales shows the no. of bales likely to benefit - MF & AF

100% likely to benefit
50% likely to benefit
10% likely to benefit

This table shows that there were over 211,000 bales[9] of wool 19.5 micron and finer wool carrying between 1% and 4% VM and within style MF 3 to 6. There was also an additional 46,000 bales within the ASF style category (see note below) making a total of 258,000 bales.

Using the same assumptions as used in 2002/03 about wool types highly likely to benefit from coating, approximately 76,000 bales may have been in the "target market" in 1999/00.

Based on these 1999/00 figures; at an average of 40 fleeces per bale; and 20% of the woolgrower target market likely to use sheep coats on the basis of net financial gains, this analysis would suggest that the potential coats market may approximate 600,000 sheep (76,000 x 40 x 20%) out of a theoretical maximum of 3.04 million sheep. Assuming coats last for an average of 3 years this could equate to 200,000 new coats per annum.

The above broad macro analysis over these two years would suggest that as a high proportion of woolgrowers producing superfine and fine wool could financially benefit from the use of sheep coats, the potential market may be in the vicinity of 0.6 million to 1 million sheep per annum (or 200,000 to 330,000 new coats per annum).

This may be a conservative estimate given that there is likely to be some additional broader micron and higher VM wool that could produce a net financial return from coats but has not been included in this analysis for the sake of simplicity. It is also difficult to estimate the rate of adoption (assumed 20%) by woolgrowers.

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**Note**: The quantity of ASF wool in season 99 does appear high, and this is likely due to several factors:

a) The Australian Superfine Type was still relatively new in 1999/2000 thus figures may be a slight overstatement, as it was bedding in; and

[9] It should be noted that a comparison of Table 8 and Table 9 shows the impact of the drought (and breeding practices) on the proportion of fine wool produced in Australia in recent years.

b) in the last season or two there has been a marked decline in true AS styled wool, largely as a result of the drought.

### 4.4.6 The Combined Financial Benefit from Improved Style and Reduced VM

As mentioned in the above Sections it is apparent that coating results in both style improvement and VM reductions for that component of the fleece under the coat. While it is problematic to combine the style and VM benefits (as suggested earlier, in practice style and VM are, in part, interrelated), an estimate is made in Table 10 for a selected component of the 1999/00 wool selling season. This season was used as it may have been more representative than the drought affected 2002/03 season. The analysis was also limited to MF style wools only (due to the low numbers of observations in ASF type wools).

In Table 10, in addition to the assumptions listed in Section 4.4.5:

- **NP =** Net Price Differential (estimated financial benefit minus coating cost) in c/kg clean. This makes an estimated combined financial benefit of VM & style changes
- **NB =** Net Price Benefit for that category ($'s = Bales x 140 kg x NP)
- Where an average marginal (approximately zero) net benefit is expected then 10 cents is added as the percentage of wools likely to be advantaged is already applied
- To be realistic, a maximum benefit of 1000 cents per kilo clean is assumed (even though the data suggests higher levels may be possible)
- Zero in the NP column means no net financial benefit

**Table 10 Net Financial Benefits 1999/2000 (number of bales x kgs x cents)**
(Fleece wool only)

| | Style Merino Fleece | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M3 to M2 | | | | | | M4 to M3 | | | | | | |
| | Bales VM 1-2 | NP (c/kg) | NB ($'s) | Bales VM 2-4 | NP | NB | Bales VM 1-2 | NP | NB | Bales VM 2-4 | NP | NB | Total Benefit ($'s) |
| Micron | | | | | | | | | | | | | |
| 16 | 165 | 270 | 46,778 | | 0 | 0 | 736 | 1,000 | 772,800 | 27 | 1,000 | 28,350 | |
| 17 | 971 | 1,000 | 1,019,550 | 8 | 1,000 | 8,400 | 7,851 | 400 | 3,297,420 | 270 | 750 | 212,625 | |
| 18 | 4,085 | 270 | 579,049 | 9 | 400 | 3,780 | 41,683 | 10 | 218,836 | 1,771 | 115 | 213,848 | |
| 19 | 5,722 | 0 | 0 | 17 | 70 | 125 | 79,813 | 0 | 0 | 3,027 | 10 | 3,178 | |
| Total | 10,943 | | 1,645,376 | 34 | | 12,305 | 130,083 | | 4,289,056 | 5,095 | | 458,002 | 6,539,951 |

| | Style Merino Fleece | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M5 to M4 | | | | | | M6 to M5 | | | | | | |
| | Bales VM 1-2 | NP | NB | Bales VM 2-4 | NP | NB | Bales VM 1-2 | NP | NB | Bales VM 2-4 | NP | NB | |
| Micron | | | | | | | | | | | | | |
| 16 | 111 | 640 | 74,592 | 10 | 1,000 | 10,500 | 2 | 850 | 1,785 | 1 | 1,000 | 1,050 | |
| 17 | 1,575 | 290 | 479,588 | 226 | 600 | 142,380 | 23 | 365 | 8,815 | 13 | 720 | 9,828 | |
| 18 | 12,265 | 10 | 64,391 | 1,650 | 155 | 134,269 | 489 | 20 | 5,135 | 70 | 200 | 14,700 | |
| 19 | 40,606 | 0 | 0 | 6,552 | 10 | 6,880 | 1,421 | 0 | 0 | 354 | 50 | 1,859 | |
| Total | 54,557 | | 618,571 | 8,438 | | 294,028 | 1,935 | | 15,734 | 438 | | 27,437 | 1,021,138 |
| Grand Total | | | | | | | | | | | | | 7,561,088 |

Key
100% likely to benefit
50% likely to benefit
10% likely to benefit

**NP =** Net Price Differential (benefit minus coating cost) in c/kg clean. This makes an estimated combined financial benefit of VM & style changes
**NB** = Net Price Benefit for that category ($'s = Bales x 140 kgs x NP)
Total Bales in Analysis 211,523
Total Bales to Benefit 83,961 (only those where some benefit expected)

Table 10 would indicate that in 1999/00:

- There were 211,000 bales in the analysis (an estimated 8.4 million fleeces)
- If we assume that the only sheep that were coated were those likely to return a net financial benefit (unlikely to be the case in practice), the number of bales in the analysis drops to about 85,000 (or 3.4 million fleeces). By considering these wools only, a net financial return (after coating costs had been included) of $7.3. million was identified (or about $2.15 per sheep on average)
- The bulk of the benefit comes from fine, better style, lower VM wools (for VM, because of the amount of such wool available). However, the style benefit from moving into "specialty types" is likely to be a finite market
- There is a marginal benefit from coating wool 18.5 micron to 19.5 micron unless it has at least 2% VM.

### 4.4.7 Where is Wool Produced that Could Benefit from Coating?

Table 10 shows the main Wool Statistical Areas (WSA's) which produced wool 18.5 micron and finer but with VM 1% to 4% and Style category of MF 3 to MF6 for the 2002/03 season. (Note: 18.5 micron and finer was used to highlight fine wool growing areas with suitable VM and style characteristics. Only those WSA's which had a minimum of 1000 bales are shown)

**Table10 WSA by Bales for Wool 18 micron and Finer with VM from 1% to 4% and Style MF 3 to MF 6**
(minimum 1000 bales)

| WSA | Total Bales | WSA | Total Bales | WSA | Total Bales |
|---|---|---|---|---|---|
| **NSW** | | **Queensland** | | **Victoria** | |
| N02 | 5,440 | Q12 | 2,273 | V07 | 1,715 |
| N03 | 18,262 | Q21 | 1,001 | V10 | 1,607 |
| N04 | 1,160 | Q22 | 1,094 | V14 | 1,456 |
| N06 | 1,708 | Q28 | 1,108 | V15 | 1,052 |
| N15 | 1,638 | | | V18 | 3,600 |
| N17 | 6,455 | **Total** | **5,476** | V20 | 1,326 |
| N18 | 1,084 | | | V21 | 7,206 |
| N19 | 5,748 | | | V22 | 4,017 |
| N20 | 1,013 | **Sth Aust.** | | V25 | 2,710 |
| N23 | 16,297 | S29 | 1,444 | V26 | 2,744 |
| N24 | 1,695 | | | V29 | 1,870 |
| N26 | 1,060 | **Total** | **1,444** | | |
| N28 | 1,473 | | | **Total** | **29,303** |
| N29 | 1,122 | **Tasmania** | | | |
| | | T03 | 2,115 | **W.A.** | |
| **Total** | **64,155** | T04 | 2,100 | W06 | 1,062 |
| | | T05 | 1,786 | W09 | 1,909 |
| | | T06 | 1,596 | W10 | 1,069 |
| | | | | W11 | 1,718 |
| | | **Total** | **7,597** | W12 | 2,039 |
| | | | | W14 | 1,007 |
| | | | | **Total** | **8,804** |
| | **Grand Total** | **116,779** | **bales** | | |

This analysis was repeated for the more representative 1999/00 season[10] and is shown in Table 11.

[10] Woolmark (2004)

**Table11 WSA by Bales for Wool 18.5 micron and Finer with VM from 1% to 4% and Style MF 3 to MF 6**
(minimum 1,000 bales per WSA)

| WSA | Total Bales | | WSA | Total Bales | | WSA | Total Bales |
|---|---|---|---|---|---|---|---|
| **NSW** | | | **Queensland** | | | **Victoria** | |
| N02 | 2960 | | | | | V18 | 1678 |
| N03 | 12683 | | | | | V21 | 4067 |
| N17 | 4515 | | **Total** | **0** | | V22 | 2310 |
| N19 | 3497 | | | | | V25 | 1720 |
| N23 | 8171 | | | | | V26 | 1579 |
| | | | **Sth Aust.** | | | V29 | 1560 |
| **Total** | **31,826** | | | | | | |
| | | | **Total** | **0** | | **Total** | **12,914** |
| | | | | | | | |
| | | | **Tasmania** | | | **W.A.** | |
| | | | T03 | 1020 | | W09 | 2412 |
| | | | T04 | 1024 | | W12 | 1716 |
| | | | | | | W13 | 1229 |
| | | | **Total** | **2,044** | | | |
| | | | | | | **Total** | **5,357** |
| | **Grand Total** | | **52,141** bales | | | | |

Comparing Tables 10 and 11, the following is evident:

- The overall reduced number of fine wool bales in 1999/2000.
- The increased amount of fine wools coming from Queensland in 2002/03
- The consistent nature of fine wool production with VM and style categories that may benefit from coating in certain Wool Statistical Areas.

This simple analysis highlights that the following areas are those which may benefit from coating of sheep.

**NSW** – New England Tablelands, Monaro and the Central Tablelands

**Victoria** – Central Victoria and the Western District

**Queensland** – Central West and southern Queensland, including the Traprock region.

**WA** – Central and Great Southern

**Tasmania** – Southern and Northern

**SA** – South East

Maps highlighting these areas are provided in the main Report

# 5. Key Conclusions

The primary conclusions relating to the use of and advantages from sheep coats are as follows:

**Current Use**

1. While difficult to estimate, up to 100,000 sheep Australia wide may have been coated per annum over the last couple of seasons.
2. The majority of coats used in Australia are manufactured in China. While the majority of those used are nylon, some polyethylene coats are still sold.
3. The use of Polypropylene or Polyethylene as a coating material would appear to be problematic as these textile fibres can impact on the whole of the wool industry, (potential contamination and perception issues from customers of Australian wool) and not just those growers who use them.
4. The useable "life" of coats in the field varied enormously depending on fabric and environment. This has been reported as ranging from 3 months to 5 years.
5. Woolgrower preferences in relation to coat design, method of application, and timing of application (strategic or tactical) also vary.

**Impact on Raw Wool Quality**

6. There has been a significant amount of research undertaken over many years in relation to the benefits from using sheep coats on raw wool characteristics and processing performance. Differences in trial design make direct comparison of trials difficult and results variable.
7. There is no doubt that some raw wool characteristics are positively influenced by coating sheep, especially VM, style, yield and tip weathering.
8. In environments where VM is an issue, VM can be reduced to FNF for the covered fleece component. When used for less than 12 months the average reduction in VM is about 2%.
9. Coating usually improves Style by approximately one style grade.
10. Where sheep type and environmental conditions lead to a prevalence of fleece rot (and perhaps also fly strike) the use of coats may have a positive impact on these animal health issues. There are also potential negative implications such as increased fly strike from ill-fitting coats.
11. Other raw wool characteristics are far more variable in their response. Mean fibre diameter, staple length, staple strength, clean fleece weight and sheep liveweight do not appear to consistently alter from the use of coats.
12. An improvement to the value of sheep skins from coating is unlikely to be commercially viable.

13. The conduct of a trial to simply further elucidate the value of coating on raw wool characteristics is unlikely to be a sound investment as much of this work has already been done.

## Impact on Processing

14. The results of processing trials show that wools' processing performance is positively affected by coating. However, some variation in results is evident.
15. Card looses, noil, top yield and VM contamination in tops are generally improved as a result of coats reducing tip weathering and VM of the greasy wool.
16. The impact of coats on Hauteur was less consistent and may be a result of trial design.
17. The results of processing trials would appear to be in line with expectations from the improvement in raw wool characteristics.
18. Most work to date has concentrated on examining the impact of coating on early stage processing. There has been little work undertaken to examine what, if any, improvements there may be in fabric characteristics such as potential benefits to fabric comfort and evenness of dyeing arising from reduced tip weathering.
19. The conduct of a trial to simply further elucidate the value of coating on wool processing is unlikely to be a sound investment as much of this work has already been done.

## Impact on Prices

20. There is a lack of robust information on the impact of coats on wool price.
21. Over the years there have been some studies which have estimated the costs and benefits of coating sheep. These studies suffer from limited observations and differences in the way in which costs are attributed or the wool was valued.
22. The majority of cost benefit analyses are based on estimated or modeled prices and not market prices established by the wool buying trade. This is a significant limitation.
23. Previous research paints a relatively marginal (at best in some cases) return on investment from using sheep coats. Indeed, if all costs were accounted for a loss rather than a financial gain would have been the usual outcome. However, sheep type used in some analyses was a prime cause of this finding.
24. Sale results provided by individual growers combined with observations made at wool sales indicate strong evidence of premiums for coated wool in very specific market segments – with some ranging from $2 to $10 per kilogram. While alluring, these results are based on one on one comparison and thus need to be treated with caution.

25. Improvements in VM and style grade are likely to provide a financial return from coating in wool which is 18.5 micron and finer and preferably where style can be improved into a specialty type.
26. A macro-economic analysis conducted during this study would suggest that an increase in net returns to woolgrowers is possible from the application of a greater level of coats targeted at specific wool types. However, the industry would benefit from a further more robust evaluation of the true costs and benefits from coating sheep.

## Issues Faced

There are a number of common issues that many woolgrowers and suppliers identified as warranting improvement, including;

27. The quality of the coat must be improved, particularly in relation to:
    a. Inconsistent fabric quality.
    b. UV stability.
    c. Coverage.
    d. Shape retention, especially around the front and back.
    e. Loss rate.
    f. Ability to adjust the coat over time to cater for animal and wool growth.
    g. Ease of application and removal.
28. There is a lack of clear and robust costs and benefits associated with coating sheep.
29. There is a lack of consistent extension information about the types of sheep which may benefit from coating.

## What Could the Coat Market Possibly Be?

30. Based on a simplistic macro analysis of wool sale statistics, at least 600,000 to 1 million sheep could benefit from being coated in the future.
31. This equates to the sale of 200,000 to 330,000 new coats per annum.

## And Where?

32. Analyses of Australian wool sale statistics indicate that areas most likely to benefit from the use of sheep coats are:
    a. **NSW** – New England Tablelands, Monaro and the Central Tablelands

b. **Victoria** – Central Victoria and the Western District

c. **Queensland** – Central West and southern Queensland, including the Traprock region.

d. **WA** – Central and Great Southern

e. **Tasmania** – Southern and Northern

f. **SA** – South East

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