5. Wool Classing

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Learning Objectives

On completion of this topic you should have an understanding of:

- Main breeds of sheep kept in Australia and their breed characteristics
- Principles which underlie wool classification in Australia
- Characteristics of wool fibre and their relationship to wool classification
- Importance of wool preparation to achieve a quality clip

Key terms and concepts

Wool Harvesting, Wool Preparation, Code of Practice, Crossbreeding, Dual Purpose, Shedding Breeds, Classing Factors, Wool Characteristics, Skirting Technique, Wool Faults, Skirting Ratio.

Introduction to the topic

Wool from a large number of sheep is sorted and matched to obtain large, uniform batches suitable for processing.

It is critical that the wool harvesting operation supplies wool of known and predictable characteristics to the wool processing industry. Where wool faults and contaminants occur, they can have serious consequences for processing.

The aim of the AWEX Code of Practice for the AWEX Quality System, Preparation of Australian Wool Clips: The Woolclasser, 2007-2009 is to ensure that raw wool provided to the world's wool trade is of a quality suitable to meet the diverse needs of processors.

The AWEX Code of Practice aims to ensure:

- presentation to the processor of lines of wool that are uniform in visible wool characteristics
- minimal risk of contamination
- accurate documentation.

5.1 Wool production and harvesting

The production and harvesting stage covers the on-farm activities from the sheep through to the broker's store. It discusses the progress of wool from the producer to the woolstore, including wool harvesting, handling and preparation practices that contribute to better processing performance.

Pre-shearing

It is good practice to crutch sheep three months prior to shearing to minimise the risk of urine and dung stain contaminating the wool. This can also be an appropriate time to identify sheep that display characteristics significantly different from those of the general mob and to be subsequently culled off shears.

Variables such as age, sex, health and the maternal state of ewes will produce variations in wool characteristics between mobs within a flock which will require those mobs to be kept separate, however where mobs are of similar breeding and husbandry conditions the Woolclasser may choose to combine those mobs to create larger lots.

Mobs should be drafted and presented separately for shearing

During shearing

Normal flocks are managed according to mob principles, which should apply throughout shearing, including the order in which sheep are shorn.

Ideally, an empty pen should separate a new mob entering the shed. This will minimise the risk of boxing mobs that could be different and the risk of contamination.

Shearing

The sequence of shearing aids in keeping different wool types separate. The belly wool is removed first, then wool from the lower legs (shanks), the short pieces around the crutch and the topknot from the head. The belly wool may contain urine and brisket stain and vegetable matter. It will also be shorter and have a different appearance to the fleece wool.

The shank wool is short, matted and may contain kemp. This type of wool is difficult to dye and can create a problems if found in the fleece, skirtings or locks. Short pieces from around the crutch may contain stain or be too short for the pieces line. There will also be locks from second cuts and short pieces trimmed from the body as the shearer removes the rest of the fleece.

All these faults can create processing problems and downgrade the fleece wool.

Shearing board activities

Shed hands working on the shearing board have responsibility for:

- removing stain from bellies (stain-free bellies of a good length and colour are often included in a topmaker's mill batch)
- correctly picking up and throwing the fleece to allow the shed hands and classer to do their job properly
- sweeping the shearing board between sheep and during shearing to minimise the risk of stain getting in the fleeces and wool bins
- picking out any stain in the locks
- placing the different types (bellies, stain, locks and topknots) in separate, clearly marked bins or packs.

Wool table activities

The fleece is thrown on the table in a manner that allows the removal of wool that differs significantly from the rest of the fleece; for example, wool from around the crutch, short sweaty edges (fribs), second cuts, clumps of vegetable matter, matted jowls, open backs, stain, dark fibres, skin pieces and blood.

The fleece and skirted pieces are placed into clearly marked bins or packs containing wool of like types. It is normal practice for the classer to check the uniformity of the contents of these bins throughout the shearing of each mob. All these different wool types have an end use and it is important they are uniform. If a lot is not uniform, this may be reflected in the objective measurements and sample of the lot, a lack of confidence of the buyer in that lot and a lower return to the woolgrower.

Pressing and branding

When a mob is completed, if the next mob to be shorn is quite different, it may be necessary to clean out bins, sweep the floors and change oddments packs.

Once each bale is pressed it is labelled according to requirements of the AWEX Code of Practice, with:

- farm brand
- wool description
- bale number
- woolclasser's number.

In the wool book the presser will record the bale number, the wool description placed on the bale and the weight. The classer will mark off breaks in mobs and make any relevant comments regarding the age and sex of the mob and lotting in the Remarks column. It is the classer's responsibility to check the wool book entry.

The information in the wool book is used to prepare the Woolclasser's Specification and provide information to the broker regarding lotting and rehandling.

Contamination

Contamination is a major quality issue in the wool industry.

When raw greasy wool is contaminated, it affects the whole wool pipeline, from the sheep property to the cloth/fabric manufacturer. The various contaminants in raw greasy wool increase costs along the wool pipeline by reducing wool buyer competition and confidence in wool products in Australian and international markets.

If the risk of contamination is managed and the wool is prepared to a consistent standard, the customer can have confidence that they are receiving a quality product that meets their specifications.

Further details on contamination can be found in Topic 5.5 Skirting Technique

5.2 Sheep Breeds in Australia

Introduction

Australian sheep growers have bred sheep for the production of meat and wool that suit particular climatic and geographical conditions in various parts of the country. There are many sheep breeds that suit particular areas of Australia for various reasons. Sheep are bred to have particular progeny attributes and the required constitution and soundness to survive in specific climatic and geographical conditions.

Breeds are generally grouped under the following headings:

- Merino and Merino derivatives
- British Long Wool breeds
- British Short Wool breeds
- Australasian breeds
- carpet wool breeds
- Shedding breeds.

Merino sheep breeds

The predominant breed of sheep in Australia is the Merino. The first Merino was brought to Australia from Spain by Captain John Waterhouse in 1797. In later years, the Saxon (German Merino) was introduced in Tasmania. The Rambouillet (French Merino), Vermont (American Merino) and other Merino sheep from South Africa and England were introduced throughout mainland Australia.

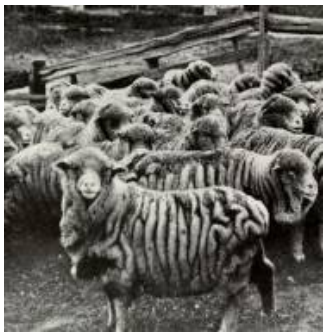


Figure 5.1 Vermont (American Merino) were introduced with the misguided intention of increasing fleece weight.
No copyright restrictions: Photographed by Kerry and Co, Sydney, 1884-1917

Various types of Merino sheep were developed over many years for wool or meat production and for crossbreeding with British and Shedding breeds for mutton and prime lamb production, and in recent years for the live sheep export trade, which has been an important adjunct to the Australian sheep industry.

Sheep are suited to various types of country in Australia, including High-Rainfall Zones, Sheep/Wheat-growing Zones and Pastoral Zones. Various Merino sheep types are adaptable to each zone and sheep breeders are continually selecting types to suit climatic areas.

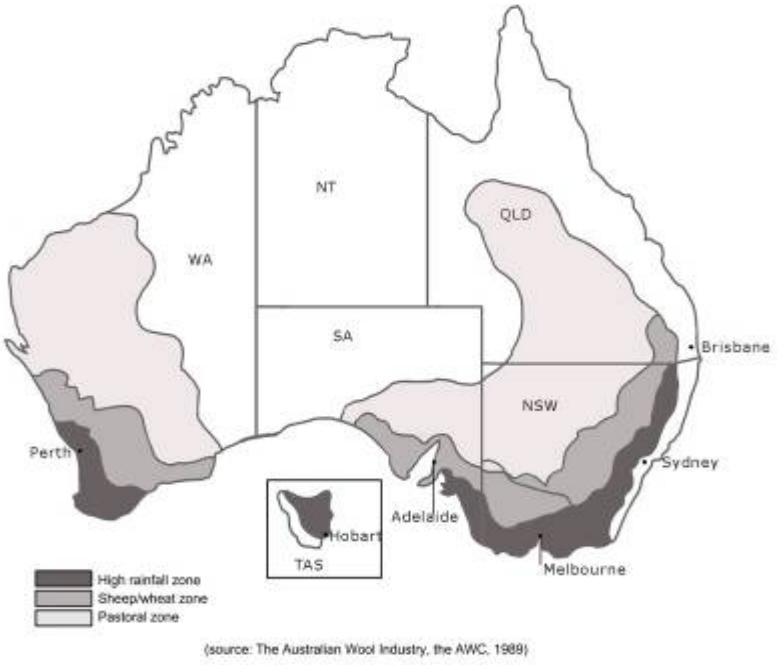


Figure 5.2: Sheep distribution map of Australia. Source: Stuart MacPherson

There are various strains/types of Merinos that have been developed for Australian conditions. The following is an outline of their general characteristics.

Merino wool represents 85.16% of the total Australian wool clips across all breeds (2006/2007). (Micron Profile of Auction offering by Breed, season 2006/2007, AWEX).

Superfine Merino

The Superfine Merino (Saxon type) is found in the New England and Yass Districts of New South Wales, the Western District of Victoria and the Midlands of Tasmania. These sheep are small, compact, well woolled, with dense covering, soft handle, excellent white colour (good bloom) and produce wool of 70 millimetre staple length and 18 microns and finer (visual quality count: 74s–80s–90s).

Superfine wool, 18.5 micron and finer, represents 22.95% of the Australian wool clip (2006/2007). (Micron Profile of Auction offering by Breed, season 2006/2007, AWEX).

Figure 5.3 Superfine Merino.
Source: Stuart MacPherson

Figure 5.4 Superfine Merino wool
Source: Stuart MacPherson

Shedded Superfine

Shedded Superfine is wool grown on a Saxon Merino (Sharlea) sheep housed and fed indoors. It is superior to paddock-grown wool because it is free from dust, vegetable matter and wool tip damage (weathering) and has an average fibre diameter of less than 17.5 microns (µm).

Fine Merino

The Fine Merino (Saxon type) is found mainly on the tablelands of New South Wales, southern areas of Victoria, the south-west of Western Australia and the Midlands of Tasmania. It is medium-sized with a compact frame, well woolled, with soft, bright white coloured, dense fleece. It produces wool of 75 millimetre staple length and 19 micron fineness (visual quality count: 70s).

The current offering (2005/2006) of fine wool, 18.6 – 19.5 microns, represents 16% of the Australian wool clip.

Figure 5.6 Fine Merino.
Source: Stuart MacPherson

Figure 5.7 Fine Merino wool.
Source: Stuart MacPherson

Medium Merino

Medium Merino (Peppin strain) is one of the largest groups of sheep in Australia and is suited to a wide range of pastoral regions. It is found throughout New South Wales, Queensland, Victoria, South Australia and Western Australia. It has a large frame, is well woolled, has a bold front and excellent conformation. It produces a heavy fleece of soft handle and white colour, with a staple length of 90 millimetres and a fineness of 21 microns (visual quality count: 64s).

Medium micron Merino wool, 19.6 – 22.5 micron represents 39% of the Australian wool clip (2006/2007).

Figure 5.8 Medium Merino.
Source: Stuart MacPherson

Figure 5.9 Medium Merino wool.
Source: Stuart MacPherson

Strong and Extra Strong Merino

The Strong Merino is prominent in South Australia and Western Australia, where it has proved to have a strong constitution. It has a bold front, broad back and deep, long, solid body. It produces heavy-cutting white fleece, with a staple length of 100 millimetres and a fineness of 23–25 microns (visual quality count: 60s–60s/58s) or, in some instances, 27 microns (visual quality count: 56s).

Strong merino wool 22.6 and stronger represents 8% of the Australian wool clip (2006/2007).

Figure 5.10 Strong/Extra Strong Merino. wool.
Source: Stuart MacPherson

Figure 5.11 Strong/Extra Strong Merino

Source: Stuart MacPherson

Poll Merino

The Poll Merino is a hornless sheep, which has the ability to produce offspring without horns. Poll Merinos can be found in all Merino areas of Australia.

Dual-purpose sheep

Sheep breeders have been experimenting for many years to produce dual-purpose animals that suit particular environments, such as the Booroola Merino, Bond, Cormo, Dohne and South African Meat Merino.

Dohne

Dohne is a dual-purpose breed developed by the South African Department of Agriculture using Peppin type Merino ewes and German Mutton sires. It is naturally polled and plain bodied. The progeny have been interbred and selected for high fertility, rapid lamb growth rate and fine and white wool of 18–22 microns (µm) under commercial pastoral conditions. It was introduced into Australia in 1998 and is a well-balanced dual-purpose breed.

Figure 5.12 Dohne.
Source: Stuart MacPherson

Figure 5.13 South African Meat Merino (SAMM).
Source: Stuart MacPherson

South African Meat Merino (SAMM)

Originally known as the German Mutton Merino, the SAMM was imported into South Africa from Germany in 1932. It is a dual-purpose breed, developed to produce a heavy slaughter lamb at an early age and good dense wool. With high lambing percentages, ewes produce ample milk and rear multiple lambs easily. A polled sheep, it has a large frame with a fleece of white wool of 23 microns and finer (visual quality count: 60s).

British long wool breeds

The British Long Wool breeds were originally brought to Australia for experimental purposes. These sheep are suited to high-rainfall areas. They have introduced many valuable characteristics to the Australian sheep industry in various breeding programs, such as high mutton quality and good mothering abilities.

Lincoln

The Lincoln has a large frame, is hornless, and has a forelock hanging over its face. It has a white face, with a black muzzle and black feet. It has lustrous wool of 200–300 millimetre staple length and 34–41 microns (visual quality count: 32s–40s) with medullated fibres. It was used to produce first-cross ewes as prime lamb mothers and for original breeding stock for the development of the Polwarth and Corriedale breeds.

Figure 5.14 Lincoln

Figure 5.15 Lincoln wool

Source: Stuart MacPherson **Source: Stuart MacPherson**

Border Leicester

The Border Leicester is a large-framed, hornless sheep. Its head is entirely free of wool. It has a Roman nose, a black muzzle, black hooves and long white legs. It has lustrous wool of 175–225 millimetre staple length and 32–34 microns (visual quality count: 44s–46s). The Border Leicester is used to produce first-cross ewes that are prolific in producing twins, are good milkers and produce quickly maturing lambs. This breed is suited to lower rainfall areas of Australia.

Figure 5.16 Border Leicester.
Source: Stuart MacPherson

Romney Marsh (Australian Romney)

The Romney Marsh is a large-framed, hornless sheep. It has a thick topknot, white face, dark nostrils, black hooves, and kemp fibres on face and legs. The hard black hooves enable the breed to be tolerant to hoof infections in wet conditions. It produces demi-lustrous wool of 75–200 millimetre staple length and 30–34 microns (visual quality count: 44s–50s). Romney Marsh ewes are excellent mothers and when crossed with British Shortwool breeds, produce high quality prime lamb.

Figure 5.17 Romney Marsh.
Source: Stuart MacPherson

Figure 5.18 Romney Marsh wool.
Source: Stuart MacPherson

British short wool breeds

The British Short Wool breeds are commonly called the Downs breeds. They are generally used as prime lamb sires.

The Downs breeds have fine grain meat. Their wool is comparatively harsh to handle, chalky or flat lustre, of 50–130 millimetre staple length and 23–27 microns (visual quality count: 60s–56s).

Southdown

The Southdown has a small blocky frame and a wide back. Its head is well covered with wool and polled. It has brown nostrils and black hooves. Its wool tends to be harsh handling, of 50–75 millimetre staple length and 24–29 microns (visual quality count: 60s–58s). It is used as a sire for the production of prime lamb and fine grain meat.

Figure 5.19 Southdown.
Source: Stuart MacPherson

Figure 5.20 Poll Dorset.
Source: Stuart MacPherson

Dorset Horn and Poll Dorset

The Dorset Horn has a medium blocky frame, a wide long back and wool level to top of muzzle. It has strong curled horns (Poll Dorset without horns). It produces wool that is often chalky white and relatively harsh of 75–125 millimetre staple length and 26–32 microns (visual quality count: 58s–50s). Dorset Horn and Poll Dorset are renowned as prime lamb sires and are mated to crossbred, British Long Wool or Merino ewes.

Suffolk

The Suffolk has a medium blocky frame, wide back, black head to top of poll, black legs, dark nostrils and black hooves. It is hornless. Its wool is of 75–100 millimetre staple length and 26–33 microns (visual quality count: 58s–56s). The Suffolk is renowned for its hardiness, the exceptionally quick growth of lambs and high dressing percentage. It is adaptable to drier areas of the Sheep/Wheat Zone and high-rainfall areas.

The White Suffolk was developed from breeding programs involving the Suffolk breed, which was initially crossed with a white breed (mainly Poll Dorsets). Its head is white, free of wool and hornless, and its legs are white. The White Suffolk is adaptable to the Sheep/Wheat Zone and high rainfall areas.

Figure 5.21 Suffolk.
Source: Stuart MacPherson

Figure 5.22.White Suffolk.
Source: Stuart MacPherson

Australasian breeds

The Australasian breeds include Coopworth, Corriedale, Polwarth, Perendale, Poll Dorset, Gromark and South Suffolk. The Corriedale and Polwarth have been developed as dual-purpose sheep. They have good wool producing and mutton characteristics and a most satisfactory reproductive performance.

Corriedale

The Corriedale is a dual-purpose sheep. It was bred from purebred Merino ewes mated to the English Long Wool Lincoln rams. The subsequent half-bred progeny were then inbred for seven generations to maintain a new 'pure' breed.

The Corriedale has a large framed body practically free of skin wrinkle, polled head, white face, mottled to dark nostrils, dark hooves and woolled legs. The wool is of 100–150 millimetre staple length with a fibre diameter of 25–32 microns (visual quality count: 58–50s). Corriedale ewes are excellent mothers. It is a hardy breed, adaptable to cold, wet conditions.

Figure 5.23 Corriedale.
Source: Stuart MacPherson

Figure 5.24 Polwarth.
Source: Stuart MacPherson

Polwarth

The Polwarth is a dual-purpose sheep bred from a Lincoln–Merino cross. The Polwarth is three-quarter Merino and one quarter Lincoln, and closely resembles the Corriedale in general appearance. The Polwarth has a large framed body, usually with some neck folds, polled, has no kemp on face or legs, and is well woolled. The wool is of 100–130 millimetre staple length with a fibre diameter of 23–25 microns (visual quality count: 64s, 60s, 58s).

The Polwarth is particularly suited to wetter and colder areas where medium and strong wool Merinos do not thrive. The Polwarth is a dual-purpose breed with almost equal emphasis on meat and wool production. It is noted as an easy-care sheep and the ewes are good mothers.

Recently introduced breeds

Finn

A recent import from Finland and Denmark, Finn sheep are a fast growing lean sheep breed. Multiple birthing of triplets and quads is common.

The main influence of the Finn has been in crossbreeding systems and competing with the first cross ewe market.

The Finn is a white fat tailed breed. The head is polled, face free from wool and has white hooves.

Figure 5.25 Finn ewe with quadruplets
Source: Stuart MacPherson

Shedding breeds

It has been approximately 25 years since the first Shedding breeds were imported into Australia. Some breeds shed the fleece in the paddock and have coloured fibres (black, brown or red). Fleeces may have kemp or medullated fibres. Shedding breeds are used for meat production and crossbreeding purposes.

Awassi

The Awassi has a large frame. It is a fat-tailed breed with pendulous ears, a brown/black (pigmented) head and coloured legs. The Awassi fleece varies in colour from brown to white and has medullated fibres (composed of 69% wool, 24% hair and 7% kemp), 150–200 millimetres in length and 33 microns. The meat is lean. Ewes have a high milking ability and are good mothers.

Figure 5.26 Awassi.
Source: Stuart MacPherson

Figure 5.27 Damara ram.
Source: Stuart MacPherson

Damara

The Damara is a fat-tailed sheep, which was imported from South Africa in the 1990s. It sheds its fleece and can be of different colours: tan, brown or black and white spotted (pigmented). The fleece consists of hair with a fine layer of wool. Damaras are predominantly horned.

Karakul

The Karakul is a medium sized, fat-tailed breed suited to arid regions. The fleece is lustrous, 25–36 microns, 200 millimetres in length, usually black but can be red, brown and white (pigmented body). The Karakul is multi-purpose breed, grown for pelt, fleece and meat.

Figure 5.28 Karakul.
Source: Stuart MacPherson

Figure 5.29 Dorper.
Source: Stuart MacPherson

Dorper

The Dorper is a South African mutton breed with a pigmented head and neck, a high lambing percentage and good mothering ability. Its fleece is wool, kemp and hair, which if not shorn regularly, will shed. Its pelt is highly sought after.

Crossbreeding

Crossbreeding involves mating various pure breeds to produce a crossbred type to suit particular requirements, for example:

- environment (climatic conditions)
- availability of feed (natural, improved or supplementary)
- quality of carcase (export)
- wool (reasonable value)
- hybrid vigour – growth rate
- mothering ability (e.g. first cross vs pure Merino).

Sheep characteristics

The following breed characteristics are important in crossbreeding:

- Merino: quality of wool.
- British Long Wool (BLW): large frame, good mothering ability, twinning factor, milk value.
- British Short Wool (BSW): compact frame, quick maturing, quality meat.
- Australasian breed: quality of wool, large frame, good mothering ability, good milking, twinning factor.
- Carpet Wool breeds: specialist wool, quality meat.
- Shedding Wool breeds: good mothering ability, quality meat, ability of some to thrive in semi-arid environments.

Comeback breed

Comeback sheep are dual-purpose sheep (wool and mutton). They are suited to the improved pasture, high-rainfall areas of south-eastern Australia.

Comebacks are medium-framed, plain, full-bodied sheep. They have open, white faces that are free from wool and mottled nostrils. Their hooves vary from dark to light and mostly polled (without horns).

Comeback wool has visual quality count of 60s/58s and a micron range of 22–24 microns. Comeback wool has a staple length of 110 millimetres. Fleeces are bright, soft, heavy-cutting and have good character.

First cross ewe breeding

Wool growers have traditionally bred First Cross ewes to sell to prime lamb breeders (see the first breeding chart in Figure 5). Generally, these wool growers are from the Sheep/Wheat Zones of Australia.

A requirement for growing out prime lambs is good finishing pastures or fattening crops. These conditions exist in High-Rainfall Zones. In recent years, wool growers from High-Rainfall Zones have entered the prime lamb market by crossing Merino ewes directly with British Short Wool rams (see the second breeding chart in Figure 5). This crossbreeding enables rapid entry into the prime lamb market. A shortfall of this crossbreeding is that the lambs have only a short opportunity for sale. As the lambs carry a direct line to the Merino, they carry a strong wool-growing trait. When the lambs are approximately three months old, their milk and feed intake is directed to wool growth rather than to body growth.

When prime lambs are bred using the traditional method of two crossings (see the first breeding chart in Figure 5), body growth lasts longer and the sale opportunity is extended.

Increasingly, Merino stud breeders are considering body and meat traits as part of the selection criteria, which includes higher twinning rates and milk production.

Risk of contamination

The introduction of Shedding breeds has opened discussion of fibre contamination risks. The crossing of Shedding breeds into the Merino flock or running them on the same property may cause cross-fibre contamination from pigmented or medullated fibres. This will affect the white wool industry. Proactive sheep/wool management on the property is an important factor in reducing contamination of white wool.

The other important issue is wool clip preparation, where there is a risk from handling and preparing wool from multiple sheep breeds.

The risk assessment is based on and associated with various sheep breed characteristics:

- degree of pigmented fibres
- tendency to naturally shed the fleece
- presence of significant amounts of medullated/hair fibres.

Table 5.1 Risk assessment of different breeds of sheep.
Source: AWEX COP

Breed	Risk assessment
Merino, Australian Superfine, SAMM, Dohne	Low
Polwarth	Low
Border Leicester, Cheviot, Coopworth	Medium
Corriedale, Dorset Horn, English Leicester	Medium
Perendale, Poll Dorset, Romney Marsh, Texel	Medium
Carpetmaster, Drysdale, Elliotdale, Lincoln, Southdown, South Suffolk, Tukidale	High
Awassi, Damara, Dorper, Karakul	Very High

It is the woolclasser's responsibility to assess the wool during preparation to monitor the presence of pigmented or medullated fibres. The woolgrower is a required to declare on the Woolclasser's Specification, contact between Merino breeds and sheep that have a risk assessment of very high.

Shearing shed procedures and wool clip preparation

Shearing shed procedures and wool clip preparation are important considerations in preventing contamination where various sheep breeds are managed or shorn on the same property.

Prevention of contamination by pigmented/medullated fibres
The AWEX Code of Practice stipulates: Any pigmented or medullated wool or wool that is at risk of containing pigmented or medullated fibres (eg. white wool sheep which have been mated to and/or reared pigmented or partly pigmented/medullated sheep), and is to be prepared in the shed, must not be prepared until after all white wool has been prepared and pressed.

5.3 Classing Factors

Introduction

Wool buyers purchase lines of wool at auction from various farms to create consignments that meet the requirements of processing mills. The object of woolclassing is to create even (visually and according to test results), saleable lines of wool that have uniform processing capabilities.

Eight classing factors

This learning resource discusses the factors that form the basis for classing all wool sold through the auction system:

- breed of sheep
- size of the wool clip
- fibre diameter range
- the mob concept
- staple strength
- colour
- length
- yield.

A successful woolclasser will always take these factors into account when determining which lines to make. This results in even lines of fibre that meet the requirements of wool processors and maximise the return to the wool grower.

Breed of Sheep

Merino

Merinos are generally more selectively bred to produce a large quantity of wool of a particular type and micron. In these situations, the variation within a flock of sheep kept in similar conditions is small; therefore, the majority of the fleece wool can be classed into the main line.

Crossbred

'Crossbred' refers to all breeds of sheep other than Merino. Crossbreds are commonly the outcome of a Merino and British Long Wool cross. As each of these breeds can be at extreme ends of the micron range, the progeny may display an equally broad range of visual quality number. Therefore, crossbred fleeces may be classed into two or even three bins based on visual quality number. This will allow for a variation of two quality numbers in each bin.

The following are categories of common crossbreds.

British Long Wool

British Long Wool breeds include Border Leicester and Romney Marsh . British Long Wool sheep (also described as Lustre wool sheep) are a long-fleece sheep.

British Short Wool (Downs)

British Short Wool (Downs) breeds include Dorset, Southdown and Suffolk. British Short Wool sheep are a group of breeds that produce a short and spongy fleece. As these sheep are primarily meat producing breeds, the wool is less significant and is classed on length and colour only. The wool is distinctive and has its own areas of use in fill products, such as doonas.

Carpet wool

Carpet wool breeds include Tukidale, Carpetmaster, Drysdale and Elliotdale. Carpet wool breeds produce wool for the carpet industry. Carpet wool contains a high percentage of coarse medullated (hollow) fibres, which allows the carpet pile to spring back after compression.

Shedding Breeds

In recent years a number of new sheep (meat) breeds have been introduced into Australia. These breeds are notable as they shed their fibre. Examples include Dorper, Damara, Awassi, and Karakul. These breeds are significant from a classing perspective as their fibre is usually pigmented and/or medullated. These fibres are problematic when they exist in Merino wool.

The AWEX Code of Practice

Standards for classing wool from each of these categories are defined in the Code of Practice for the AWEX Quality System, Preparation of Australian Wool Clips: The Woolclasser 2007-2009.

Size of clip

The woolclasser aims to create even lines of wool that are suitable for processing and maximise the wool grower's net returns. The woolclasser should endeavour to put together large and even lines of fleece, pieces and bellies where practical. In the wool trade, a line of four bales can be considered a large lot. However lines of 8 – 12 bales are preferable.

In small wool clips, lines of wool from compatible mobs should be combined to make large lots where possible. Compatible mobs are sheep of the same breed and type with the same dark and medullated fibre risk rating, which have been run under similar environmental and management conditions since the previous shearing.

Irrespective of the size of the wool clip, wool from sheep being shorn for the first time (hoggets, weaners or lambs) must not be combined with wool shorn from other sheep, as wool from younger sheep is usually finer and retains a spiral tip.

The smaller the lot, the greater the selling costs per bale. For larger clips, the optimum number of bales per lot is somewhere between 15 and 20 bales.

Testing costs can be found on the Australian Wool Testing Authority (AWTA) website at www.awta.com.au.

Table 5.2 Testing costs for IWTO Greasy Wool Core Test Certificates, 2007-2008. Source: AWEX COP

Number of bales	Certification fee ($)	Cost per bale ($)
2	35.23	17.62
4	38.29	9.57
8	41.02	5.13
10	42.37	4.24
16	45.77	2.86
20	48.04	2.40

Table 5.3 Testing costs for IWTO Staple Length and Strength Certificates, 2007-2008. Source: AWEX COP

Number of bales	Certification fee ($)	Cost per bale ($)
2	21.10	11.05
3	24.37	8.12
4	26.63	6.66
5	27.76	5.55
6 and over	28.90	4.82

Fibre diameter range

Average fibre diameter (micron) accounts for 60–80 per cent of clean wool value.

Variation

Within any wool clip there will be a large variation in fibre diameter. In a Merino wool clip, it is not unusual for the finest wool to be eight or nine microns finer than the broadest wool. Some wool growers are now using on-farm fibre measurement (OFFM) to manage and reduce some of this variation.

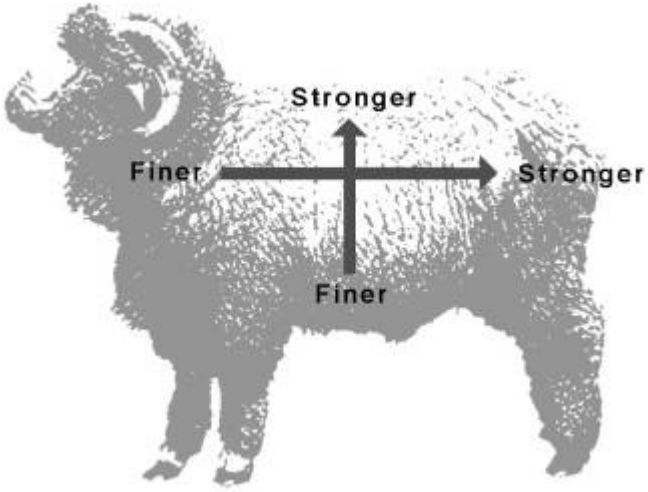


Figure 5.30 Variation in average fibre diameter on a sheep. Source: Stuart MacPherson

Micron variation occurs along a single fibre, between individual fibres within a single fleece and between fleeces. It is the role of the woolclasser to minimise the variation of fibre diameter within lines. To do this, the woolclasser removes fleeces from the main line that are:

- visually broader than the main line (outside a third quality number group or approximately 2 micron broader).
- noticeably harsher in handle than the main line
- distinctly doggy in appearance.

The main line (AAAM) will be based on the bulk of the wool clip in a Merino flock and contain wools of up to three consecutive quality numbers.

Mob or flock concept

Compatible mobs are sheep of the same breed and type that have been run under similar environmental and management conditions since the previous shearing. The wool from compatible mobs will have less variation in average fibre diameter and other characteristics than the wool from mobs that are not compatible.

Staple strength

Unsound (tender) fleeces must be separated from sound fleeces and branded accordingly.

The only instance where tender wool should not be removed from the main line is if all fleeces from a particular mob are found to be tender. The main line will be branded AAAM and fleeces that have a 'window' break would be classed out. The woolclasser would then make the appropriate comments on the Woolclasser's Specification supplied to the wool broker.

Figure 5.31 Window tender wool
Source: Stuart MacPherson

Colour

Wool processors who manufacture high-grade products require white yarn free from dark fibres and contamination. Therefore, the wool buyer aims to source good quality wool, free from unscourable colour and contamination. Fleeces (ignoring the dust colour of the clip) of a good white or creamy appearance should be classed into the main line.

For Superfine clips, woolclassers make lines of bright, white fleeces and keep creamy-coloured fleeces separate. This ensures that fleeces can be dyed soft pastel shades.

Unscourable stain

There are a number of unscourable stains that can be found in fleeces, including:

- canary stain – unscourable (bacterial) colour, bright yellow-coloured wool
- water stain – colours other than yellow (green, red, blue and brown) – sometimes known as Fleece Rot.
- fern stain
- charcoal stain
- pen stain.

Unscourable or stain-affected wool should never be classed in with white wool. In some fleeces, the affected stain areas can be removed from the rest of the fleece.

Urine stain and dung stain should be removed on the board or during the skirting process. Where possible, remove urine and dung stain on the board.

In determining unscourable colour it must be remembered that greasy colour is not a good indicator of clean colour. Fleeces generally possess a range of natural condition colour. Fleece can range from a bright white through to a rich gold shade. The ability to determine an unscourable as opposed to a scourable colour can take some practice. Generally an unscourable yellow will be a bright colour and will appear as a band within the staple which will coincide with the period when the bacterial infection took place, usually a period of continual wet and humid conditions.

Figure 5.35 Water stain
Source: Stuart MacPherson

Canary stain

The type of unscourable colour must be separated and indicated on the Woolclasser's Specification. For example, if water stained wool is present the Woolclasser's Specification must state that this lot contains water stained wool.
Wool that has been affected by dermatitis should be kept separate from colour lines.

Length

Eighty per cent of length variation occurs within a single staple, while approximately 10 per cent occurs within the fleece. This means the woolclasser effectively only has control over 10 per cent of length variation.

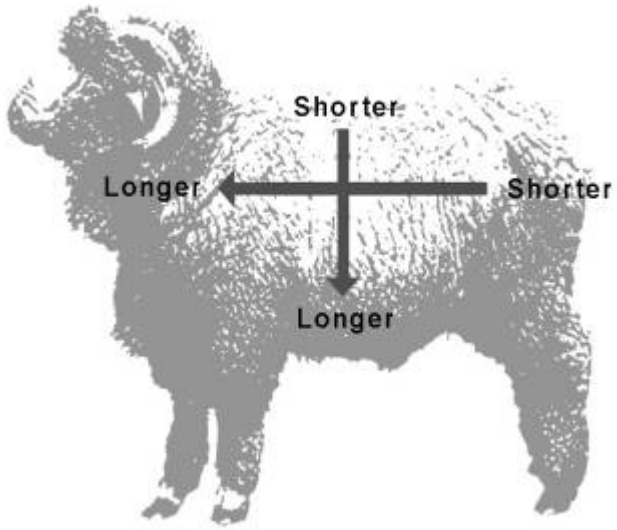


Figure 5.33 Variation in length on a sheep.
Source: Stuart MacPherson

When classing wool, the woolclasser must create a separate line for significantly shorter wool (as a guide, less than two-thirds of the average length).

Figure 5.33 Variation in length on a sheep.
Even though the bidding for wool is done in cents per kilogram greasy, all wool is bought on a clean basis. Yield is the percentage of clean fibre that can be obtained from greasy wool. The wool buyer uses the yield to calculate how much clean wool they are actually buying.

Yield will be affected by many factors, including:

- breed of sheep
- moisture content
- condition (grease and suint)
- vegetable matter content

- dust content
- length of staple.

It must be noted that sheep that have run together since the previous shearing are likely to have minimal yield variation. However, where fleeces carry significantly heavier condition (i.e. grease) then the fleece should be removed from the main line.

If significant differences apply to dusty wasty backs or vegetable matter then portions of those fleeces can be removed from the main line.

Classing to the bulk of the clip

As earlier stated, the role of the woolclasser is to create even saleable lines of wool which have uniform processing requirements.

Environmental and management conditions can change from mob to mob, neighbour to neighbour or district to district, it is the woolclasser's ability to class to the bulk of the mob or flock that sets the classing parameters for individual situations.

For this reason, a vegetable matter content or greasy colour which is classed as significantly different in one situation may well be acceptable in another.

To assist with the preparation of classing lines, Woolclassers are advised to view previous clip reports and discuss with the woolgrower prior to the commencement of shearing.

5.4 Wool Characteristics

This section explains how fibre growth factors are applied to clip preparation. It discusses:

- fibre diameter
- length
- staple strength
- colour
- character
- softness
- style
- condition and yield.

A number of characteristics of greasy wool affect the wool's processing efficiency and end use.

Fibre diameter

Fibre diameter is the single most important characteristic of wool and is responsible for between 70% and 80% of the value of greasy wool. The woolclasser groups together lots of wool based on visual assessment of fibre diameter.

The fibre diameter will vary up and down individual fibres as much as between fibres, between staples and between fleeces.

Fibre diameter is measured in microns, with one micron equal to one millionth of a metre.

In some sheds, the average micron of the individual fleeces will be known because the fleeces have been tested either prior to or at shearing.

End use of wool

The fibre diameter determines the end use of the wool. Fine wool is more versatile and can be used for a greater range of garments than coarse wool. Fine wool makes better quality knitwear, woven outerwear and underwear. Coarse wool is generally used for socks, carpets, knitwear and hand-knitting yarns.

Wool processors use fibre diameter and the variability of fibre diameter (expressed as coefficient of variation) as the main determinant of spinning fineness.

Factors that influence fibre diameter

There are many factors that influence fibre diameter, including breed of sheep, age, nutrition, parasites and stress.

Breed of sheep

Pure bred sheep selected for uniformity are likely to have less variation in micron than crossbred sheep.

Sheep that have been bred the same way and run under the same environmental conditions will be more consistent in average fibre diameter than sheep with different bloodlines that have been brought onto the property.

Age

Fibre diameter increases with the age of the sheep.

Nutrition

Fibre diameter varies along the length of the wool fibre, depending on the nutrition available when the fibre was growing.

The wool of underfed or drought-affected sheep will test finer than it visually appears. Conversely, the wool of sheep with an abundance of feed may test coarser than it visually appears.

Significant increases in nutrition, such as seasonal breaks and an abundance of feed, will create an increase in the fibre diameter. Alternatively a significant decline in nutrition or feed will cause a reduction in diameter and will become evident as a weakness or tender break within the length of the fibre and staple.

Parasites

Internal or external parasites can affect the amount of nutrients the sheep ingests. The wool will be finer if the sheep has not received adequate nutrition.

Severe parasite infections reduce total wool production and can cause a tender break in the wool.

Stress

Lambing ewes often have a break in the wool. The stress of lambing can cause an abrupt reduction in fibre diameter, which leads to a break in the wool.

Staple structure

Staple structure plays a role in determining the average fibre diameter.

It has recently been argued that wool with pencil-shaped, thin staples is finer, more even and processes better than the traditional thick, blocky staple. In recent years, the trend has shifted towards the pencil-shaped, thin staple. This type of staple is ‘positive microning’; that is, it tests finer than it appears.

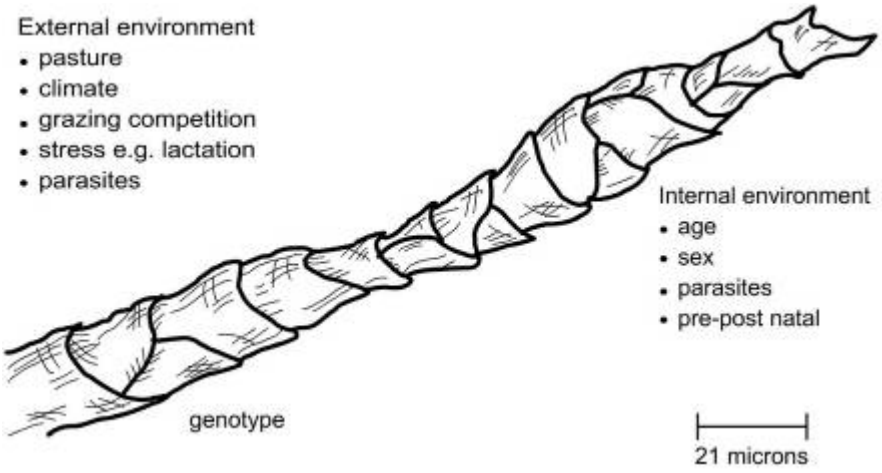


Figure 5.34 shows additional factors that affect fibre diameter.
Source: Stuart MacPherson

Length

Wool length is one of the most important woolclassing characteristics after fibre diameter, as the length affects the processing ability of the wool.

Wool length is influenced by the breed of sheep, the amount of feed a sheep receives and where on the fleece the wool is growing. Fine wool is mostly shorter than strong wool.

Combing wool

Wool that is 50 millimetres or longer is called combing wool. It is generally used in the worsted trade.

Examples of combing wool are good length fleece, pieces and bellies.

Carding wool

Wool that is shorter than 50 millimetres is called carding wool. It is generally used in the woollen trade.

Examples of carding wool are locks, short lambs and crutchings.

Measuring length

The Australian Wool Testing Authority (AWTA) measures the staple length of sale lots using an Atlas machine.

Samples to be tested are drawn from a grab sample. A minimum of 55 staples are selected from the 66 tufts drawn. The length of each staple is measured and then averaged to give the sale lot figure in millimetres.

In the wool sale catalogue, the coefficient of variation of length percentage (CV%) is also given. This allows prospective wool buyers to determine the variability of length in a sale lot. As a guide, Merino fleece wool should be under 20%, while skirtings lines are usually more variable and a figure over 20% is acceptable. Even lines of fleece wool will be between 10–15%.

It is not mandatory to test wool for staple length, but evidence shows that untested lots are discounted substantially, often by 30–40 cents per kilogram.

Desirable length

Each micron category has a desirable range of length for processing. For example, the preferred length for 20 micron wool is approximately 90 millimetres. For 19 micron wool, the preferred length is approximately 80 millimetres.

If the measured length of a sale lot is outside the preferred range, either significantly longer or shorter, a price discount may apply. The AWEX Premiums and Discounts Report, which is issued weekly, shows the discounts that may apply.

Length variation within a fleece

Research has found that about 80% of length variation occurs within a staple of wool. About 10% of the variation occurs between staples, and the remaining 10% between fleeces.

This means that the woolclasser can have little influence on length by trying to pick shorter lines out. Only significantly shorter fleeces than the average of the mob should be removed. Significantly shorter staples are less than two-thirds the average length of the clip.

Superfine Merino

The preparation of better-styled Superfine Merino wool is slightly different. Greater uniformity of length is required as a 5–10 millimetre difference can affect the price received.

Staple strength

Staple strength is the ability of wool to withstand the pressure of processing, including spinning, combing and carding.

Tender wool has a low staple strength and will break during processing. This causes wastage and an excess of shorter fibres. Sound wool is more valuable than tender wool as it can withstand processing.

Wool processors are increasingly requesting sounder wool so that processing machinery can run at higher speeds. This makes wool a more competitive textile fibre.

Testing for staple strength in the shearing shed

The woolclasser needs to check each fleece in several positions to determine its staple strength.
A staple of about pencil thickness can be tested by holding the staple as close to the tip end and butt end as possible in the thumb and forefinger of each hand. The woolclasser needs to be careful not to cover a potential weak spot in the staple by gripping the staple to close to the middle. Firm pressure is then applied to the staple.

Distinctly tender wool will break relatively easily. Part tender wool will stretch before breaking. Sound wool will have little give when pressure is applied.

Usually, only combing length fleece wool is tested for staple strength.

It takes considerable experience to judge sound and tender wool, so this skill should be practised with a wide range of wool types.

Factors influencing staple strength

Wool does not grow evenly throughout the year. The thickness of an individual fibre varies along the length of the fibre due to a number of factors, including nutrition, lambing, and the general health of the sheep. Fly strike, footrot and illness can also affect fibre growth. Some factors, such as nutrition, may affect every sheep in the mob, while a disease may only affect individual sheep.

The stress of lambing can cause tenderness in fleeces. Many wool growers have switched to shearing about six weeks before lambing is due to begin, so that any potential break in the wool is close to the tip of the next fleece.

The ideal fibre for processing would be even the entire length of the fibre, as this would create excellent staple strength. In reality, this rarely happens, as a change in any factor, such as an increase or decrease in feed, will affect the fibre growth. For example, in spring, when there is a flush of feed, the sheep will be well nourished and the fibres will increase in diameter.

In severe cases, the wool fibres will virtually stop growing for a short period of time. This can cause a visual break in the wool and result in wool with very low staple strength.

A good farm manager will recognise the potential for fibre diameter variation during the year and will attempt to minimise the peaks and troughs of feed variation to ensure the fibre is as even as possible.

Classing for staple strength

The woolclasser has to decide on the average staple strength for a mob of sheep and determine which fleeces should be removed.

In a normal, well-bred mob of sheep that has received adequate nutrition throughout the year, it may be necessary to remove only the odd distinctly tender fleece.

In other mobs, nearly every fleece may be tender. In this case, the mob should be classed out as normal and only fleeces with a visual break in the staple should be removed. The woolclasser should then note on the Woolclasser's Specification that the entire mob was tender.

Weaner wool (from sheep more than six months old) is usually fine and is potentially the most valuable wool of the clip. Weaner wool is likely to be part tender. Care should be taken not to over class weaner wool and split the wool up too much, as the average staple strength of the mob may be low.

Measuring staple strength

AWTA tests for staple strength. Testing for staple strength is not compulsory, but discounts are applied to fleece wool that is not tested.

The staples tested for staple length are tested for staple strength. Staples shorter than 50 millimetres are not tested.

To test staple strength, each staple is stretched until it breaks. The point at which the break occurs, known as the position of break (POB), is also recorded. The staple strength and the position of break results are shown in the wool sale catalogue.

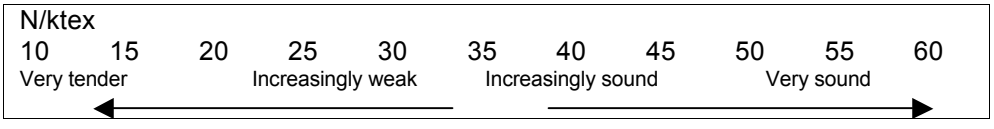
Wool growers can use staple strength and position of break results to determine periods of stress or feed shortage. Processors will specify the average fibre length and the tolerance of variation they require. If the break is in the middle of the staple, a line of wool can be deemed unsuitable for processing.

Staple strength results

The unit of measurement for staple strength is newtons per kilotex (N/ktex). The force required to break the staple (newtons) is divided by the clean staple thickness (kilotex). The average for the lot is then calculated.

Table 5.4 sets out the range in mean staple strength that may be found in Australian wool.

Table 5.4 Mean staple strength range for Australian wool.
Source: AWTA



Position of break results

The position of break is reported in the wool sale catalogue as the percentage of staples that broke at the tip, the middle and the base. For example, a result of 5/53/42 would indicate that 5% of staples broke at the tip, 53% of staples broke in the middle and 42% of staples broke at the base.

Processors prefer wool that breaks at either the tip or the base, rather than in the middle (mid-break). Tender wool with a predominant mid-break halves the length of the wool staple; for example, an 80-millimetre staple will become two 40-millimetre staples, which is below combing length. Tender wool increases the amount of shorter wool, or noil, present in processing.

Colour

Greasy wool can either have scourable or unscourable colour.

The greasy colour of wool helps determine its end use. Processors prefer wool that will scour, or wash, to a white colour, as this wool is more versatile and allows a greater choice of dye colouring.

Merino wool is generally whiter and brighter than crossbred wool.

Scourable wool may have either a white or creamy colour. Creamy colour will usually cover the entire staple and will scour to a white colour.

District colour is caused by environmental factors, such as location, climate and rainfall. District colour will be reflected in the mineral impurities, such as dust, dirt or sand, found in the fleece.

Character

Character refers to the crimp definition of the wool. Good character wool has a well-defined, outstanding crimp. Good character wool processes better than wool with fair or poor character as the fibres in the staple are evenly aligned. Good character wool has usually grown evenly and is less variable in length and fibre diameter.

Fair character wool has visible crimp in the staple, but the size of the crimp or the evenness may vary along the staple. This may be caused by uneven growth during the year caused by uneven periods of nutrition.

Poor character wool has little or no crimp. Poor character wool is usually more variable and harsher to handle, as the fibre grows unevenly. Poor character wool should not be mixed with fair or good character wool.

Wool with a false or uneven crimp is called doggy wool. Older Merino sheep are more likely to have doggy wool. It is less common in crossbred sheep. Doggy wool may also have a lustrous shiny appearance and a heavy greasy black tip. It does not process as well as wool with better character.

Woolclassing for character

The woolclasser should be able to distinguish between fleeces of different character. Generally, only fleeces with a distinctly doggy or very plain appearance should be removed from the main line of a clip. When classing Superfine wool, more lines are made based on character as greater uniformity is required.

Figure 5.36 Good character wool and doggy wool.
Source: Stuart MacPherson

Softness

The softness, or handle, of wool is not a measurable characteristic. However, wool that is soft to handle may have less variation of micron in the fleece. Soft-handling fleeces are also likely to be finer in average fibre diameter.

Harsh-handling fleeces have more variation in micron and do not process as well as soft-handling fleeces. Harsher handling fleeces should be kept separate from softer handling fleeces.

Selection of sheep for soft handle will result in soft wool that test finer than it visually appears. Wool that tests finer than it visually appears is known as 'positive microning' wool.

Style

Style in wool is a combination of character, tip structure, dust content, vegetable matter content and uniformity of length.

Stylish wool has an even pronounced crimp, a tip structure that does not allow excessive dust penetration and uniform length.

Stylish wool and sound wool have good tearing capacities; that is, a good percentage of tops to noils (short fibres).

Merino wool styles

Table 5.5 Styles of Merino wool.
Source: AWEX COP

Style	Style number	Description
Choice	1	Only found in the best Superfine wool. Minimal dust, no vegetable matter, a high percentage of top to noils (very sound), low grease content.
Superior	2	Mostly found in Superfine types. Sound combing wool with good colour, but not as sound as choice. Free or nearly free of vegetable matter and light grease content.
Spinners	3	Sound combing wool with good length and colour and light vegetable fault. Quite sound but not as stylish as superior types.
Best topmaking	4	Reasonably sound combing wool, fairly bright colour but some unevenness of length and staple strength. Light to medium vegetable fault and light dust. May have higher grease content.
Good topmaking	5	Reasonably sound combing wool, bright but may be thinner than best topmaking. Irregular length, medium vegetable matter and dust content.
Average topmaking	6	Combing wool that may have poor tearing capacity (soundness). May have higher vegetable matter and dust content.
Inferior topmaking	7	Inferior combing wool with irregular length. Wasty, poor tearing capacity (soundness); may contain heavy dust with burr and grease.

Figure 5.37 Different styles of Merino wool: Superior (2), Spinners (3), Best topmaking (4), and Good topmaking (5). Source: Stuart MacPherson

Condition and yield

Condition refers to the amount of yolk in a fleece. Yolk is a combination of wool grease (wax) and sweat (suint).

Yolk has the following functions:

- lubricates the fibre
- nourishes the wool
- protects the fibre from dust and water penetration
- protects the tip from ultraviolet rays which make the tip brittle.

When processors purchase wool, the price they pay is based on clean wool; that is, wool that has had all the impurities removed. Wool that contains a large amount of impurity may require extra processing; this will increase manufacturing costs.

Impurities include the following:

- wool yolk
- vegetable matter
- mineral matter (dirt and dust).

Yield refers to the amount of clean wool available for use after all the impurities have been removed.

Types of condition

Light condition wool has a small amount of impurity. It feels dry to handle.

Medium condition wool has an average amount of impurity. It feels greasy and may have a black tip.

Heavy condition wool has an excessive amount of impurity. It has an excess of grease and probably has a black, greasy tip.

Types of impurities
There are three types of impurities: natural impurities, acquired impurities and applied impurities.

Natural impurities
Natural impurities, such as grease and sweat, are derived from the skin of the animal. The combination of grease and sweat forms a substance called yolk.

An excess of yolk results in low-yielding wool. A small amount of yolk results in high-yielding wool, but the lack of fibre protection may cause fibres to be damaged and brittle.

Heavy conditioned wool should be kept separate from light and medium conditioned wool.

Acquired impurities
Acquired impurities, such as vegetable matter, earthy matter and moisture, are acquired during the growth of the fleece.

Vegetable matter content in wool varies throughout Australia. Wool from some areas may have small amounts of vegetable matter, such as seeds or shive, while wool from other areas may contain large amounts of burrs.

Earthy matter includes all types of sand, dust and loam. Sheep grazing in the High-Rainfall Zone with good pasture cover are likely to have low amounts of earthy matter in the wool. Conversely, sheep grazing in the Pastoral Zone with dry conditions and low amounts of pasture are likely to have much more earthy matter in the wool. More earthy matter results in low-yielding wool.

Wool fibres readily absorb moisture. Moisture content varies according to the climate. Wool absorbs more moisture in moist and humid conditions and less moisture in dry conditions.

Variations in dust colour between mobs should be kept separate. This may occur when sheep have been brought in from a different property or where varying soil types and conditions may exist on larger properties.

In times of drought, excess dirt in the back line of the fleece may need to be skirted out.

Applied impurities
Applied impurities are usually chemicals, such as drenches, dressings, brands and dips. These impurities are generally applied as part of normal husbandry practices. Careful use of chemicals minimises the affect of applied impurities on the yield of the wool.

All brands must be removed from the fleece at skirting. It is recommended that brands not be applied to sheep.

Wool that is observed to contain chemicals from animal husbandry practices should be kept separate.

Vegetable matter
The major types of vegetable matter are as follows:

B – clover and burr medics
S – seed material, shive, grasses and thistle
H – hard heads (woody burrs), sticks and twigs

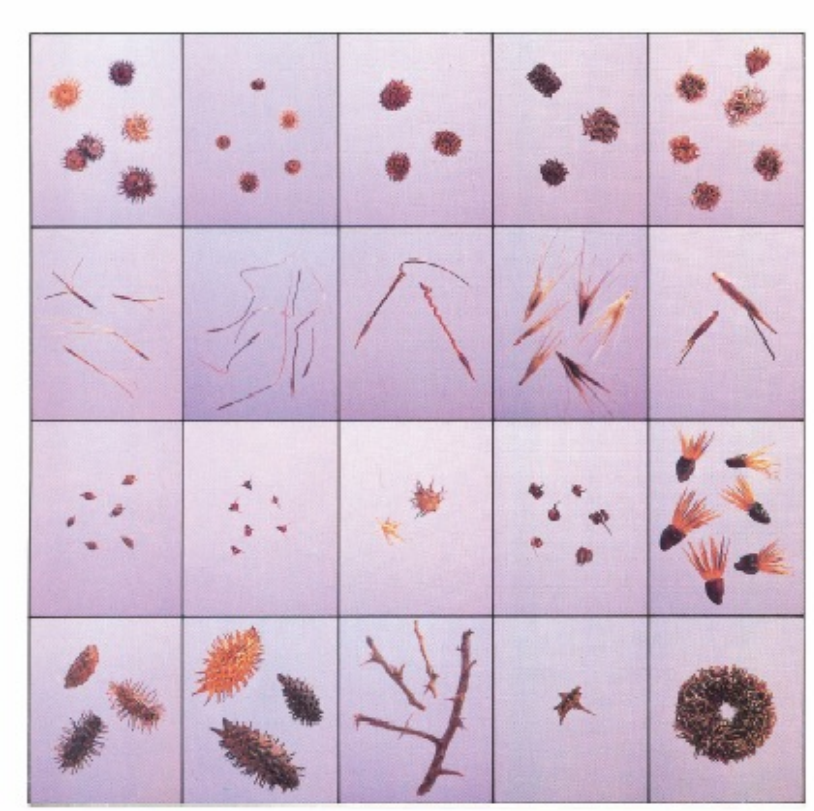


Figure 5.38 Types of vegetable matter that may be found in greasy wool.
Source: Stuart MacPherson

Removing vegetable matter

Different types of vegetable matter affect processing in different ways. Some types are easier to remove than others.

Table 5.7 Relative difficulty of removing types of vegetable matter
Source: AWEX COP

Difficulty of removal	Combing process	Carding process only	Carbonising process
1 (least difficult)	Moit	Seed	Seed
2	Seed	Bogan flea	Shive
3	Bogan flea	Shive	Burr types
4	Bathurst burr	Moit	Moit
5	Noogoora	Burr types	Bogan flea
6	Burr types	Bathurst burr	Bathurst burr
7 (most difficult)	Shive	Noogoora	Noogoora

Flee
ce wool containing more than 12 per cent vegetable matter and carding wool carrying more than two per cent vegetable matter are carbonised. Carbonisation is a chemical process where the wool is soaked in an acid solution and baked to convert the vegetable matter into carbon. The carbon is then crushed and removed as dust. Wool carrying less than these percentages of vegetable matter is carded and combed to remove vegetable matter.

During the combing process, the most difficult types of vegetable matter to remove are shive and burr types. Medic burrs, trefoil in particular, will unravel, lay along the wool fibre length (like shive) and easily pass through the combing machine.

Woody burrs are the most difficult type to remove in the carbonising process. Carbonising involves using sulphuric acid to penetrate seeds and by baking convert to carbon. The seeds

are then pulverised into dust. Woody burrs cannot be fully penetrated and therefore remain in the wool.

Woolclassing for vegetable matter

In the majority of cases, fleeces containing vegetable matter need only light skirting. Further skirting may be required to remove clumpy burr from light fleeces.

Generally, wool from one property will contain similar types of vegetable matter. However, if there is a significant difference between mobs, the mobs should be lotted separately and noted in the Woolclasser's Specification.

Sheep that are run on bush or pastoral-type runs may contain an excess of vegetable fault, such as moit, which may need to be skirted off from the back line or neck area.

Factors influencing yield

Yield is the amount of clean fibre, at a standard regain, expected to be produced when a quantity of raw wool is processed. Yield is usually expressed as a percentage.
When a woolclasser is estimating yield, all the impurities present must be taken into account.
Knowing the yield of greasy wool allows the wool processor to calculate the quantity of fibre they will have to process.

Table 5.8 Factors that influence yield.
Source: AWEX COP

Factor	Description
Fibre diameter	Coarse wool yields more than fine wool as the fibres have a smaller surface area per kilogram.
Length	If wool differs only in length, the longer wool will yield more than the shorter wool, due to the proportion of wool tip to staple length.
Yolk	Light conditioned, well-nourished wool yields more than a heavy, fatty wool that has an excess of suint or grease.
Density	Dense, nourished wool keeps out dust and dirt better than thin, open wool, and therefore yields better.
Earthy matter	As some types of earthy matter weigh more than others, sand and gritty-type matter in wool causes a lower yield than dusty or loamy wool.
Vegetable matter	Wool containing a low amount of vegetable matter yields more than wool containing a high amount of vegetable matter.

Estimating yields

Table 10 sets out the estimated yield of various fleece wool types. The figures in this table are for style three or four fleece wool of normal length with light condition, less than one per cent vegetable matter and light dust. Any change in the type or amount of impurity will alter these yields.

The yields in Table 5.9 are based on the Schlumberger Combing Yield, which is the most commonly used commercial yield. It is derived from the Wool Base. The Wool Base is the oven-dry weight of wool fibre free from all impurities and is expressed as a percentage of the weight of the greasy sample.

Table 5.9 Estimated yield of various fleece wool types (Eastern States). Source: AWEX COP

Average count	Approximate micron	Wool type	Approximate yield (%)
74s	18	Superfine Merino	73
70s	19	Fine Merino	74
64s	21	Medium Merino	75
60s/58s	23–25	Strong Merino	76
60s/58s	23–25	Comeback	76
56s	27	Fine crossbred	77
50s	30	Medium crossbred	78
46s	32	Strong crossbred	79

Classing for yield

Typically, fleece wool will yield between 60 and 80 per cent, depending on the amount and type of impurity present.

The woolclasser needs to separate fleeces that vary too much in yield from the bulk of the wool. In particular, low-yielding fleeces with heavy, greasy tips or an excess of vegetable matter or mineral matter should be removed from the main lines. It takes considerable practice to accurately estimate yields.

In some high rainfall areas, an excess of moisture can wash out the natural condition in the wool. This will result in high-yielding wool that may be brittle or damaged by the lack of fibre protection.

Composition of greasy wool

Greasy wool contains different substances. Many of these substances are removed during the scouring process.

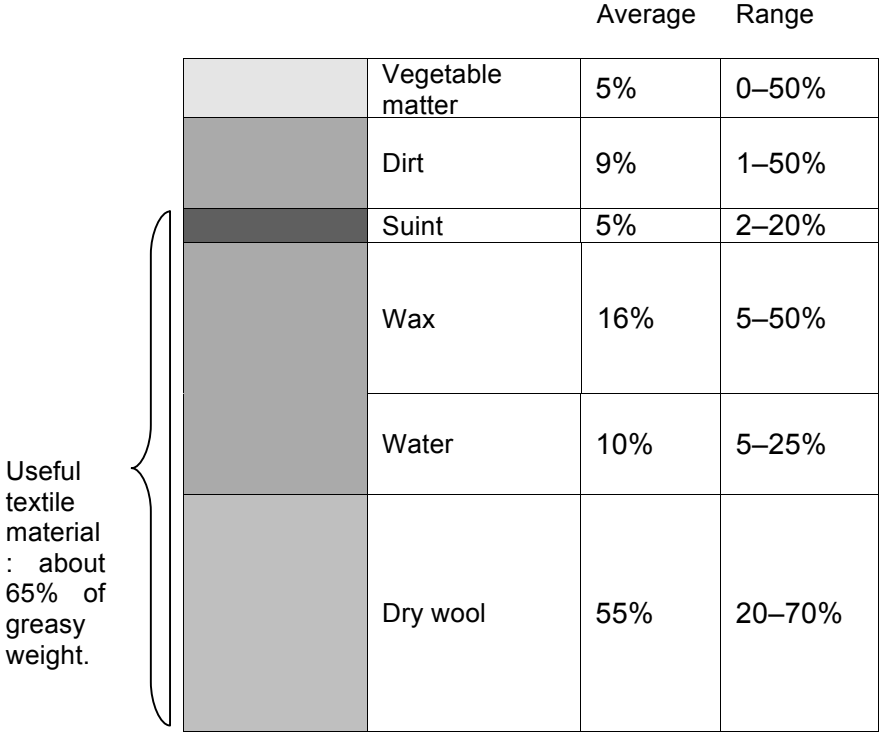


Figure 5.39 Composition of greasy wool. Source: Stuart MacPherson

5.5 Skirting technique

Introduction

Skirting involves removing all inferior wool types from fleece lines, making the fleece line more uniform and therefore improving processing performance and predictability.

Effective skirting technique is a critical part of wool harvesting. Skirting affects the suitability of fleece lines for processing and the returns to the wool grower.
This section covers:

- wool removed during skirting
- wool faults
- skirting procedure

Role of the woolclasser

The woolclasser makes the decisions about the skirting technique that will be used, including the removal of brands, the type and amount of inferior wool to be removed and the preparation of the removed skirtings. The woolclasser gives directions to the wool roller.

The woolclasser recommends to the grower the appropriate staffing ratios to achieve the desired outcome. Staffing ratios may depend on the presentation of the sheep; for example, the presence of stain, water staining or dermatitis.

Wool removed during skirting

Skirting removes wool that is significantly different from the bulk of the fleece. This is usually around the crutch area, the points of the fleece, the head and neck area and the short edges.

Skirtings are a combination of the following:

- sweaty and short edges of the fleece
- wool containing high levels of vegetable matter
- discoloured wool
- wool from around the head, including long topknots and jowls if cotted and seedy.

Any foreign objects, such as twine or wire, are also removed.

Other areas and types of wool that may be removed include the following:

- dusty or wasty backs
- cotted wool
- water-stained areas
- portions of the fleece that have wool faults, such as dermatitis or heavy water stain.

As each clip has different characteristics, a different approach to skirting is required for each clip. There may also be considerable variation between mobs and between sheep within a mob. Each fleece needs to be assessed individually when deciding what and how much wool needs to be removed to make the fleece more uniform.

All wool removed during skirting has a valuable end use and consistency is important.

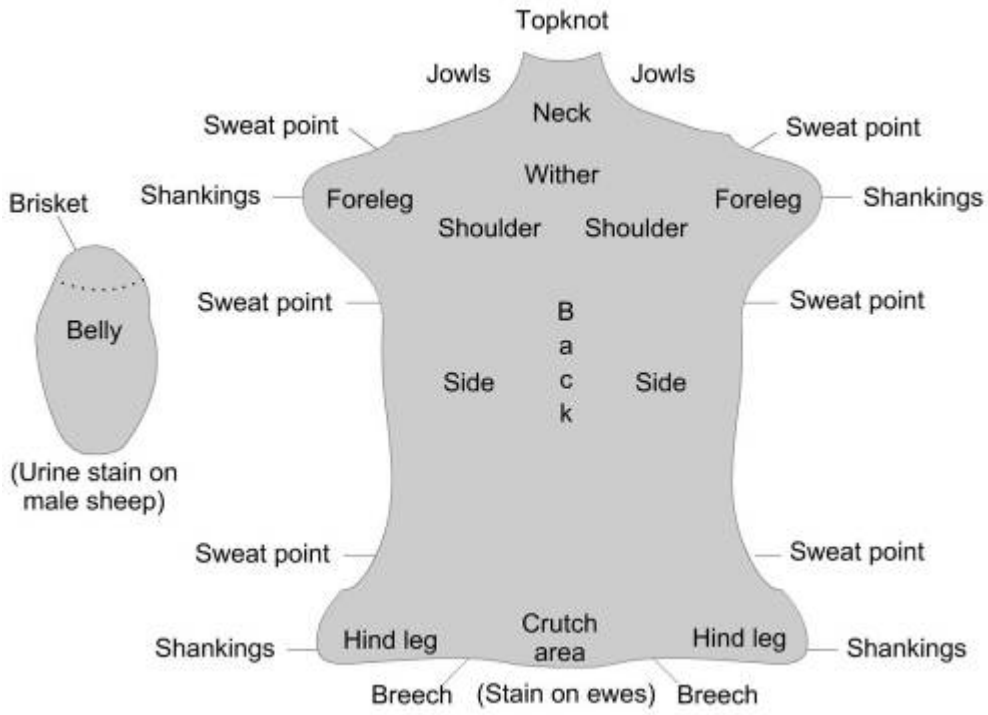


Figure 5.40 Parts of a fleece.
Source: Stuart MacPherson

Brands

Brands or markers are applied to wool to identify sheep. Under the AWEX Code of Practice, any wool affected by brands must be removed and kept separate. Although branding fluids or markers may be labelled as scourable, the integrity of these products cannot be guaranteed when the sample is being inspected and valued by wool buyers on the show floor.

Figure 5.41 Wool stained by branding fluids.
Source: Stuart MacPherson

Stain

Urine stain is a major problem for processors. A small amount of urine stain can contaminate a large batch of wool and prevent usage in a light fabric.

Stain should be removed prior to shearing, or on the board as a last resort. If stain does get to the wool table, research has shown that no matter how diligent and skilled the wool rollers are, some stain will get through to the wool top stage.

When skirting fleeces that have urine stain present, take care to go to the crutch area first and remove any stain present. Stained skirtings should be kept separate from clean skirtings and branded STN M PCS.

Figure 5.42 Stained crutch.
Source: Stuart MacPherson

Figure 5.43 Heavy dab.
Source: Stuart MacPherson

Dag

Wool containing dag is difficult and inefficient to process and contains significant amounts of stained fibre.

Dag should be removed before shearing and should not be present when the fleece reaches the wool table. If any dag is present, it should be removed immediately and placed in a separate line.

Shanks

The short wool from the lower leg should be removed and kept separate from the skirtings. Shanks should also be kept separate from locks and other lines.

Figure 5.44 Shanks showing kemp.
Source: Stuart MacPherson

Figure 5.45 Heavy jowl.
Source: Stuart MacPherson

Jowls

Jowls may be heavily cotted and contain high levels of vegetable matter. These must be removed from the fleece wool and may need to be kept separate from the main line of pieces.

Fribs and short edges

The fribs (sweat locks) and short edges are removed during skirting. The key to effective skirting is removing all sweat locks and short wool while removing a minimum of good fleece wool.

Figure 5.46 Sweat locks.
Source: Stuart MacPherson

Figure 5.47 Skin pieces.
Source: Stuart MacPherson

Skin pieces

Skin pieces may damage processing machinery and show up as a fault in finished fabric.

Skin pieces are removed as the fleece is rolled after skirting. Skirtings also need to be checked. Skin pieces must not be left in pieces or combined with any other line of wool because skin pieces have different processing requirements.

Wool from skin pieces can only be used if the skin is cut from the wool.

Contaminants of wool

The best possible strategy for managing contamination in the wool industry is to remove contaminants before they get to the wool table.

Any contaminants seen on the wool table should of course be removed. Physical contamination from heavier items that could damage processing equipment is unlikely. However, small pieces of wire that are entangled in the fleece are sometimes seen on the wool table, and other fibres such as polypropylene can be easily carried in the fleece.

Contamination of the clip can be minimised by:

- employing quality assurance strategies
- ensuring that the wool grower and all shearing shed employees are aware of potential contaminants
- ensuring that the wool grower and all shearing shed employees use appropriate procedures to minimise the risk of contamination.

The major types of contamination are:

- dark stain
- pigmented and medullated fibres
- non-wool fibres and articles
- chemical residue.

Dark stain

Dark stain is discolouration that has combined chemically with the molecular structure of the wool fibre. It is therefore permanently fixed and cannot be removed by scouring. The degree of discolouration or intensity of stain determines the dye colour needed to over-dye the stain.

Urine stain is the darkest and most permanent type of dark stain, which requires it to be separated from all other stains. Other permanent stains include dung/pen stain, water/bacterial stain, canary/yolk stain, flyblown, blood and brands.

Urine stain is a major contaminant. The risk of contamination from urine stain can be greatly reduced by crutching sheep, ideally within three months of shearing.

Sheep should be checked for urine and dung stain just before they are to be shorn and stain removed before shearing.

Pigmented and medullated fibres

Pigmented (Y) and medullated (K) fibres in wool affect processing performance and the quality of the final product. Only small amounts of pigmented and medullated fibres are needed to contaminate wool.

Medullated fibres must be kept separate from all other wool. Medullated fibres do not take up dye or spin like wool and appear as white fibres in dyed garments.

One staple of pigmented wool in one bale of white or cream wool is sufficient to prevent that wool being used for light-coloured cloth or yarn.

Non-wool fibres and articles

Non-wool fibres include clothing, towels and grease rags.

Non-wool articles include combs and cutters, screwdrivers, bale fasteners, bale hooks, small tools and drink cans.

It can be difficult to detect and remove non-wool fibres. If non-wool fibres are entangled in greasy wool, they can damage machinery in the shearing shed. Non-wool fibres that are entangled in the wool, including the fibres in cigarette butt filters, can also cause an uneven uptake of dye further down the wool pipeline.

Hard contamination is usually detected in the early stages of processing, either at the point of opening bales of wool prior to scouring or during a later process called carding. If undetected, hard contamination can cause major machinery breakdowns. Hard contamination is the easiest type of contamination to identify in the shearing shed.

Care should be taken not to contaminate any wool packs or butts with non-wool fibres. The wool press area, wool room, shearing board and sheep pens must all be thoroughly cleaned. It is important that dogs are kept out of the wool room during wool preparation and that they are prevented from lying in wool bins and on wool butts.

Only AWEX-approved nylon wool packs are used for packaging wool. Old jute or polyethylene wool packs must not be used for wool butts or pressing wool into bales.

Many types of contamination can be eliminated or reduced by good management of the shearing shed and sheep yards. This includes collecting any polypropylene baling twine (hay bands), polypropylene fertiliser bags, rope or string and putting them into rubbish bins.

Chemical residue

The correct use of chemicals reduces the risk of chemical contamination in later processing. The wool grower must ensure chemicals are used safely, responsibly, effectively and strictly according to label instructions. Where applicable, the wool harvesting interval (WHI) must be observed. The wool harvesting interval is the interval between when sheep are treated and when they are able to be shorn.

Accurate records of chemical applications should be made at the time of or soon after treatment. Records should be stored in a safe place.

As part of pre-shearing shed preparation, any chemicals that are stored in the shearing shed must be removed.

Wool faults

Any wool faults that have different processing requirements to the bulk of the fleece may need to be removed. The woolclasser's judgement on this will vary depending on the amount and type of wool faults present.

The AWEX Industry Description (AWEX-ID) wool appraisal system is an excellent mechanism to provide feedback on how effectively faults have been identified and removed from fleece and skirtings lines.

In general, the following wool faults may need to be removed.

Cotted wool

In some clips, open and free-grown wool may have small areas of cotted and matted wool. Removing these will improve the uniformity of the fleece lines. In some clips, it may be necessary to keep heavily cotted pieces separate from the skirtings line.

Figure 5.49 Cotted wool.
Source: Stuart MacPherson

5.52 Dermatitis-affected wool.
Source: Stuart MacPherson

Dermatitis-affected wool

A small number of sheep are affected by dermatitis or 'lumpy wool'. These areas will usually be removed at skirting. If the whole fleece is affected by dermatitis, keep the whole fleece separate.

Skirting procedure

There are many variations in skirting procedure; however, in all cases, the following principles should be applied:

- The woolclasser determines the type and amount of wool to be removed from each fleece.
- Faults are removed to make the fleece more uniform.
- Only the wool that needs to be removed should be removed.
- Skirting for vegetable matter is only effective for finer wool types and when clumpy burr-on-burr and shive is removed.
- Adequate staffing levels on the wool table ensure the flow of wool and contribute to an efficient wool harvesting operation.

Vegetable matter

Vegetable matter in wool includes burrs, seeds, sticks and twigs. The type of vegetable matter is largely determined by the climatic region in which the wool is grown, such as the High-Rainfall Zone, Sheep/Wheat Zone or the Pastoral Zone.

The degree of difficulty in removing vegetable matter depends on the type of vegetable matter present.

Management strategies on the property can affect the amount of vegetable matter in wool.

The woolclasser decides the amount of wool to be removed due to vegetable matter.

Vegetable matter content is usually higher around the edges of the fleece. For most wool harvesting operations, excluding specialty superfine clips, skirting for vegetable matter should only remove the heavy, clumpy 'burr-on-burr' vegetable matter.

In some clips, it may be necessary to remove skirtings containing Noogoora burr. Noogoora burr can be a problem for some processors because it is difficult to carbonise. It can also damage processing machinery. It is generally recommended to keep pieces containing Noogoora burr separate.

Heavier skirting often results in too much good fleece wool being removed. In most instances, excess skirting will only have a minimal impact on the level of vegetable matter remaining in the fleece.

In some sheds, it may be necessary to firstly lightly skirt the entire fleece and then remove heavy vegetable matter. This will typically occur in areas where there is heavy trefoil burr on the back legs, but the remainder of the fleece has very light levels of vegetable matter.

Figure 5.53 Skirting fleeces on a skirting table.
Source: Stuart MacPherson

Figure 5.4 Rolling a fleece for

Source: Stuart MacPherson

The procedure for skirting is as follows.

After the fleece is thrown, the wool rollers may need to arrange the fleece so all edges are visible to enable efficient skirting. The arrangement of the fleece will depend on the skills of the board person and how well the fleece is hanging together. Shorter fleeces with little vegetable matter will require additional work after the fleece has been thrown to prepare it for skirting.

1. Each fleece is visually inspected for the following faults: the overall amount and distribution of vegetable matter, moit, backs, heavy jowls, cotted edges, stain and the presence of brands.
2. If brands are present, and while the brand is visible, one wool roller removes brands and places them in a separate line. Any second cuts or fribs lying on the fleece can be removed at this point or shaken off the fleece later.
3. The breech is checked for stain, dags and short crutch wool. Any stain or dags present are removed and placed in a separate bin or pack.
4. The wool handler's inside hand turns the fleece in as the outside hand (fingers only) skirts the fleece.
5. Working forward, the back legs are skirted for sweaty frib and shanks (identified shanks will require separation from other oddments). Any stain is also removed.
6. Along the flank, any short wool or belly wool is removed from the fleece. Fribs are removed from around the front legs.
7. The neck and shoulder area may need moits, water stain, short wool and clumpy or cotted jowls removed.
8. As the fleece is skirted, the edges are thrown in toward the middle. The fleece will usually be rolled form the breech to the neck end, with the aim of presenting the shoulder consistently to the woolclasser.
9. As the fleece is rolled, a check is made for skin pieces, dermatitis, unscourable colour or water stain.

Skirting technique for Superfine wool

To attract a premium price, Superfine wool must not only meet a micron requirement, but must also meet preparation and fleece characteristic requirements. To achieve this, the fleece may be double skirted.

Double skirting involves:

- a first pass, which removes short and sweaty fribs
- a second pass, which removes yellowness, vegetable matter and less stylish edges, all of which have normal fleece length.

Skirting ratio

The ratio of skirtings to fleece wool for the clip and each mob is one indicator of shed preparation efficiency.

The aim of skirting is to improve the uniformity of fleece lines without removing good fleece wool.

Feedback from the wool broker that a clip had bright, high yielding pieces is not a good result.

Heavy skirting may reduce returns to the wool grower. As well as placing fleece wool into skirtings lines where it will realise a lower price, heavy skirting results in changes in fibre diameter with both the skirtings and fleece lines testing stronger.

It is difficult to quote an acceptable fleece-to-skirtings ratio. Each mob will have different characteristics and clips will vary between seasons. Most medium wool Merino clips will be in the range of 6:1 to 10:1 (6 bales of fleece to one bale of pieces). At times, some teams will achieve much higher ratios.

The aim should always be efficient skirting, to remove only inferior wool to improve the uniformity of lines. Skirting ratios are one way of monitoring this aspect of wool preparation.

A big impact on skirting ratios will come from adequate staffing ratios and presentation of sheep for shearing.

Summary

The woolclasser is the only person who sees all the skirted fleece wool and is responsible for checking and maintaining uniformity. By doing this task well, the woolclasser can give the buyer confidence in the quality of the wool displayed in the sample boxes and the test result information that accompanies each sale lot.

Wool must be carefully prepared and classed for sale to ensure:

- the wool broker can achieve the best advantage for the grower
- the wool buyer is able to confidently assess and select the types of wool required by the processing client
- the processor can achieve cost-effectiveness and customer satisfaction.

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Glossary of terms

Bloom	A term used to indicate good colour in wool.
Bold	A term applied to well grown wool of good character.
Brightness	The white colour associated with finer type wool.
Broad	The coarser wool within a quality group.
Carding Wool	Wool which suits the Carding process. Generally shorter than 40mm in length.
Carpet wool	Very strong or coarse wool, generally hairy or medullated, usually 30–40 microns (visual quality count: 34s/36s/40s). Mainly used in the manufacture of carpets.
Character	Well-bred wool of good character will show even, pronounced crimp and a well-formed staple formation.
Combing wool	Superior wool with suitable properties for worsted processing (as opposed to Carding wool).
Conformation	Refers to body structure or the build of the animal and takes into consideration the general appearance of the sheep, with regard to the standards laid down for the particular breed type.
Cotted	Fleeces that have become matted due to fibre entanglement.
Count	(Visual quality count) A number historically used to indicate fineness; for example, 64s means that 64 hanks of yarn can be spun from 454 g (1 lb) of clean, scoured tops each 512 m (560 yards) long (worsted trade). This number has been found through fibre measurement to be inaccurate and should only be used as a guide.
Crimp	A natural wave formation visible in wool. Generally, the closer the waves, the finer the wool.
Crossbred sheep	Sheep possessing the blood of two or more breeds. The term is commonly applied to the progeny of two distinct breeds, usually a British breed and a Merino.
Crossbred wool	Wool produced from crossbred sheep.
Crossbreeding	Mating of sheep from two distinct breeds to produce a half bred; for example, British Long Wool ram mated with Merino ewe.
Dags	Wool coated with manure from breech area of sheep.

Density	Used to denote the compactness of the fleece and the close proximity of fibre growth on a given surface of skin.
Dermatitis	Skin condition resulting in lumpy wool
Downs	Breed of sheep belonging to the short wool group.
Dual purpose	Sheep bred and selected for the economic production of both wool and mutton.
Evenness	Relates to the uniformity of the fleece, principally in terms of quality number and length.
First Cross	The progeny of two distinct breeds.
Fleece	The coat of the sheep, usually removed as one unit.
Flock	The entire group of sheep on a property.
Fly strike	Condition where blowfly infests an area of fleece with maggots. Usually crutch region.
Interbreeding	Crossbreeding usually by mating of half breds.
Jowls	Wool from cheek and under jaw. Removed during skirting. Can be heavily contaminated with seed.
Kemp	A hard, brittle, opaque, medullated fibre found in the fleece of some sheep. Usually coarser and much shorter than the wool fibres with which it is associated. It is shed after growing for a limited time and frequently lies loose in the fleece.
Lustre	The brilliant, glossy appearance of the wool caused by light being reflected more directly by the outside scales of the coarser wool. Usually associated with British Long Wool breeds.
Lustrous	Having the qualities associated with lustre.
Medullation	Is a term applied to fibres that have a core of air-filled cells. They will not spin or dye as readily as normal wool fibres.
Micron	A millionth of a metre or a thousandth of a millimetre, expressed as µm or um.
Noil	Short and broken fibres removed during combing process.
OFFM	On farm fibre measurement
Plain bodied	A term applied to a sheep that has relatively few wrinkles on its body.
Prime lamb	A lamb bred for meat. Generally the progeny of a first cross ewe joined to a British short wool ram.
Pure bred	An animal of a pure strain; of a recognised breed kept pure for many generations.
Quality	The standard of excellence or desirability of a sheep/fleece.
Scourable	Wool discolouration which can be washed out during the scouring process.
Second Cuts	Fibres produced as a result of a second shearing by the handpiece from the one staple

Shanks	Covering of the lower part of a sheep's leg; comprises short inferior and kemp fibres. Can be matted
Sire	A stud ram.
Skirting	Removal by hand of shorter and or discoloured fibres from edge of fleece
Staple	Numbers of wool fibres, which naturally form into clusters.
Strain	A sub-species of a breed.
Suint	Secretion of the sweat glands of a sheep
Yolk	Combined secretions of sweat and sebaceous glands that coats the wool fibre.

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