

The Swedish Wool Standard

Practical work methods and value-creating classification system for Swedish wool









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Introduction to The Swedish Wool Standard

The Swedish Wool Standard aims to increase the quality of Swedish wool and support the trading of wool on an industrial scale, by creating a common language among all the actors in the Swedish wool value chain.

The Swedish Wool Standard consists of a set of working methods and guidelines, including a classification system for Swedish wool. The Swedish Wool Standard aims to simplify and clarify the work along the wool's entire value chain. It can be used in practice by all actors working with Swedish wool on an industrial scale - from farmers and shearers to wool brokers and buyers.

The hands-on methods and guidelines described aim to contribute to effective working methods and ensure the right quality of the wool from farm to sale; the right wool at the right place to the right price. The standard includes descriptions of processes, best practices, and checklists for quality assurance as well as a method for classification of the wool.

The Swedish Wool Standard has been developed by the project partners in The Swedish Wool Initiative, a cross-sectoral collaboration aiming at contributing to the vision of zero waste of Swedish wool. The standard builds on the Norwegian Wool Standard which has been proven successful, and the Swedish standard has been remitted to a wide range of stakeholders working with Swedish wool for input and feedback.

– Companies from a variety of industries are now showing great interest in wool fiber as a renewable and circular raw material. Classifying wool in larger volumes that match current and future product needs has been guiding the development of the Swedish wool standard.

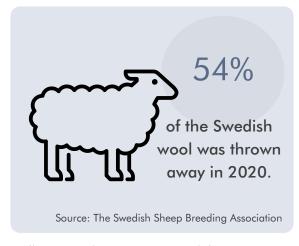
Lina Sofia Lundin, Project Manager at Dalarna Science Park



Conditions for The Swedish Wool Market

The Swedish wool market is characterized by several different sheep breeds with a wide variety of wool types. In addition, several smaller sheep farms are geographically scattered across the Swedish countryside. This complicates transport logistics and poses challenges in creating profitable business models throughout the value chain.

On the other hand, the Swedish wool has great potential. The wool's different properties are an advantage as it can be used for several different purposes, and thus have several different types of buyers with different types of requirements for the



product and the raw material. However, Swedish wool is still perceived as a raw material that exists in small volumes, in geographically dispersed locations, with different characteristics and uneven quality.

With this in mind, Swedish wool is a hard-to-sell commodity in large volumes, unless the right market conditions are in place. A system for classifying the wool constitutes an important prerequisite for quality assurance and pricing of the raw material as well as for matching each product with the right buyer. A methodology for classifying the wool contributes to creating a common language for the actors in the value chain and facilitates the trading of the raw material. However, it is central that such a classification system considers the specific market conditions for Swedish wool.

Swedish wool is hard to treat in the same way as international wool in the production steps from raw material to product due to its varying quality and often special character. The Swedish Wool Standard takes into account that Swedish wool has different properties and areas of use and acknowledges the differences between breeds and between younger and older sheep. While the quality of the wool partly depends on breed characteristics, it can also be largely affected by the care and handling during shearing and sorting. By producing the best wool possible, the wool becomes a product that is attractive to the fashion, outdoor, home textile and the building industry.

The quality of the wool is affected by the type of pasture the sheep grazed on before shearing, the shearing timing, and the health status of the sheep.



Wool Production:

Recommendations for Farmers and Shearers

The Shearing Process

The following checklists aim to simplify the work for farmers and shearers and ensure that the shearing results in wool of the highest, most valuable quality possible. The recommendations are based on information from, among others, the Swedish Sheep Breeding Association, and the Swedish Sheep Shearing Association.

Shearing sheep twice a year is preferable. While one shearing per year gives longer fiber length, it comes at the cost of wool which is often too tangled and bulky to be used in the textile industry. The timing for shearing is important. A good rule is before mating and before lambing. Never shear later than 1 month before the start of lambing. Ensure to never shear a sheep during lactation or illness. If the sheep need to be color marked, be sure to mark their heads. Color-marked wool may otherwise be sorted out since the marking color cannot be washed off.

Preparations

- Book a sheep shearer well in advance.
- Minimize plant residues, straw, and feed residues in the wool.
- Ensure that the sheep are dry, gathered, and empty in their stomachs.
- Sort the sheep by breed, color, ewes, rams, or lambs. Place the white and light-colored sheep closest.
- Arrange a well-lit, draft-free, even, and clean shearing area.
- Create a holding pen adjacent to the shearing area. Adjust the size of the pen for easy handling of the animals.
- Set up sorting tables, plastic rakes, brooms, and sacks for packing the wool.
- Ensure an adequate number of helpers for sheep and wool handling.

Ensuring clear roles of responsibility of the helpers, the easier the shearing will be for sheep owners, helpers, shearers, wool brokers, and sheep. Careful preparations and communication are key factors to reduce the shearing time and obtain wool of the highest possible quality.

During shearing

- Shear the white and bright sheep first.
- Keep track of sheep logistics and minimize waiting time.
- Keep the shearing area clean.
- Avoid second shear for a more even length of wool.
- Sweep the shearing surface thoroughly between each animal.
- The shearer sorts out belly wool.

Sorting

The better the wool is sorted and labeled on the farm, the easier the handling of the wool will be, which in turn enables a better raw material price for the wool.

To improve the quality of the wool, it's advantageous to separate out wool that is highly soiled, contains colored markings, feces, plant debris, or is matted together. The sorted-out wool can be used for purposes other than textile production.

Use sorting tables with grates or slats where second cuts and small debris fall through.



Sorting should be done according to:

- Color: Sheep should be divided into white and colored before shearing.
- Breed: Preferably divide the sheep into breeds before shearing.
- Quality: Sort out very dirty wool, wool that contains a high proportion of plant residues, belly wool, dirty tail wool, very matted wool, and wool from Dorper breeds and Dorper Crossbreds
- Ewe' s-, ram' s or lambswool

A wool broker should be consulted before packing the wool to ensure the best quality of the raw material and ensure favorable conditions for resource-efficient handling and good payment.

Packing, labelling, and storage of sorted wool:

- Pack only dry wool.
- Package the wool depending on the receiving wool broker:
 - o Large fertilizer sacks (Västkustens Ullinsamling).
 - o 125 I paper sacks (Ullcentrum).
 - o IBC cage, paper sacks, or large sacks (Ullkontoret).
- Label the sacks/cages:
 - o Date, breed, color, ewe's, ram's, or lamb's wool.
- Seal the bags tightly and store them in a dry and cool place. Avoid storing directly on concrete floor.



The Wool Classification System

Wool classing is the production of uniform, predictable, classes of wool, carried out by examining the characteristics of the wool in its raw state and classing (grading) it accordingly. The Swedish classification system is the first of its kind and has been developed based on the specific conditions of the Swedish wool market but with the ambition to harmonize with international best practices for grading and classifying wool.

How is the Wool Classification System structured?

The wool is grouped into different quality types based on its characteristics. Each quality type is then divided into several wool classes based on the parameters that define the potential area of use for the wool, see more information in the table and in the descriptions. It allows wool from different farms and breeds to be combined into larger quantities with specific qualities which are benificial in a particular end product. It can be luster and strength in an upholstery fabric, short and soft in something felted that should be close to the skin or voluminous and bouncy in padding or insulation. It is easy to do your own adjustments, so-called selection, based on the customer's wishes.



Definitions of Parameters and Analysis Methods

To class wool, it should be at room temperature.

Quality Class: The quality class is defined as white or pigmented; pigmented is, for example, class M1P. Samples can be sent for objective quality control. The International Wool Textile Organisation (IWTO) provides a standard for wool colour measurement of yellowness, IWTO 56 (y-z). Very yellow wool is classified as pigmented. Quality types have a different number of classes depending on variations within the wool type.

Length: The length of the stretched wool fibre is measured in millimetres (mm) and is assessed by the wool classer. Samples can be sent for objective quality control. The New Zealand Wool Testing Authority (NZWTA) has developed a widely used method adopted by the Wool Testing Authority Europe (WTAE).

Fineness: Measured in microns (μ), which is 1/1000 mm. There are various methods for measuring microns by the wool classer. Classes are regularly measured to ensure they remain within the standard using OFDA (Optical Fiber Diameter Analysis).

Resilience: The wool's ability to return to its original shape after being compressed or stretched. Wool with good resilience is elastic, has good crimp, produces airy and voluminous yarn with excellent insulation properties. Measured in cm³/g. Analysis method NZS8716:1994.

Crimp: Crimp refers to the natural waviness or curliness of the wool fibre. Wool with high crimp has more waves per cm than a fibre with low crimp. Fine-crimped wool is more elastic, has better resilience and insulation properties, as it traps more air than wool with less crimp.

Lustre: Lustre refers to the wool fibre's ability to reflect light. Wool with longer and smoother fibres tends to have more lustre than short-fibered wool. This property may be desirable for items such as tapestries and upholstery fabrics.

Medullation: Medullation refers to the amount of medulla also referred to ask kemp, in wool fibres. Medullated wool is a porous hollow structure in some wool fibres, making them stiffer and less elastic than non-medullated fibres. Wool with high medullation is often coarse and better suited for carpets and tweed than for close-to-skin garments, as it can feel rough. Medullated fibres are also poor at absorbing dye. Analysis method OFDA (IWTO 47).

Vegetable Matter (VM): The amount of unwanted organic materials such as hay, straw, seeds, burrs, and twigs. Estimated by the wool classer as low (0.3%), medium (0.7%), or high (1%). Classes are regularly measured to ensure they remain within the standard using IWTO, which provides a method for analysing vegetable matter in percentage.

Felting: Refers to wool fibres that have felted on the animal, forming clumps or a cohesive mass. Minor felting can be easily loosened during washing without damaging the fibre.

Character: Used to describe the wool's character. For example, it can be described as typical or atypical for the quality type. The wool classer makes the assessment.



Classing System for Swedish Wool 2.0

QUALITY M: MERINO TYPE

Quality class	Length requirement	Fineness requirement	Elasticity	Crimp	Medullation	Vegetable matter	Felting	Character	Description
M1/M1P	≥ 40 mm	≤ 22 µ	Good	Fine	≤ 3 %	≤ 0,3 %	Insignifica nt	Typical	Medullation-free, strong, elastic, and free from VM

QUALITY F: LANDRACE FINE WOOL TYPE

Quality class	Length requirement	Elasticity	Elasticity	Crimp	Medullation	Vegetable matter	Felting	Character	Description
F1/F1P	≥ 40 mm	≤ 27 µ	Good	Fine	≤ 3 %	≤ 0,3 %	Insignificant	Typical	White/pigmented, medullation-free, strong, and free from VM
F2		≤ 27 µ	Good	Fine	≤ 3 %	≤ 0,3 %	Insignificant	Atypical accepted	White, fine-fibered wool without length or strength requirements

QUALITY C: CROSSBRED TYPE

Quality class	Length requirement	Fineness Requirement	Elasticity	Crimp	Medullation	Vegetable matter	Felting	Character	Description
C1/C1P	≥ 70 mm	≤ 38 µ	Good	Distinct	≤ 3 %	≤ 0,3 %	Insignificant	Typical	White/pigmented, medullation-free, strong, elastic, and free from VM
C1L	≥ 100 mm	≤ 38 µ	Good	Distinct	≤ 3 %	≤ 0,4 %	Insignificant	Typical	White, medullation-free, strong, elastic, and free from VM. Year-round fleece
C2	40-70 mm	≤ 38 µ	Good	Distinct	≤ 3 %	≤ 0,3 %	Insignificant	Typical	White, medullation-free, strong, elastic, and free from VM. More grease accepted
C3	≤ 40mm	≤ 38 µ	Good	Distinct	≤ 3 %	≤ 0,3 %	Insignificant	Typical	White, medullation-free, elastic, and free from VM
C4	≥ 70 mm	≤ 80 µ			≤ 10 %	≤ 0,7 %	Slight felting accepted	Atypical accepted	White, medullation and slight felting accepted, VM accepted

QUALITY S: STUFFING WOOL TYPE

Quality class	Length requirement	Elasticity	Medullation	Vegetable matter	Felting	Description
\$1	≥ 40 mm	Very good	≤ 3 %	≤ 0,3 %	Insignificant	White, medullation-free, very elastic, and free from VM. Texel- and Suffolk-like wool
S2P	≥ 40 mm	Very good	≤ 10 %	≤ 0,7 %	Insignificant	Pigmentation and medullation accepted, very elastic, and free from VM

Classing System for Swedish Wool 2.0

QUALITY P: LANDRACE PELT TYPE

Quality class	Length requirement	Fineness requirement	Lustre	Medullation	Vegetable matter	Felting	Character	Description
P1/P1P	≥ 70 mm	≤ 60 µ	Distinct	≤ 3 %	≤ 0,3 %	Insignificant	Lamb	White/pigmented, medullation-free, strong, and free from VM
P2/P2P	≥ 70 mm	≤ 60 µ	Distinct	≤ 3 %	≤ 0,3 %	Insignificant	Ewe	White/pigmented, medullation-free, strong, and free from VM

QUALITY V: LANDRACE WADMAL TYPE

Quality class	Underwoo I Length			Guard Hair Length	Guard Hair Fineness	Medullation	Vegetabl e matter	Felting	Character	Description
V1/V1P	≥ 40 mm	mm ≤ 2	25 μ	≥ 40 mm	≤ 60 µ	≤ 3 %	≤ 1,0 %	Insignificant		White/pigmented, medullation-free, strong, rich in under wool, and almost free from VM
V2/V2P				≥ 40mm			≤ 1,0 %	Slight felting	Coarse Pelt/Wadmal	White/pigmented, medullation accepted, and
¥2/¥21				2 4011111			S 1,0 /0	accepted	Course reil/ waamar	almost free from VM

QUALITY R: LANDRACE RYA TYPE

Quality class	Under Wool Length	Under wool fineness	Guard Hair Length	Guard Hair Fineness	Lustre	Medullation	Vegetabl e matter	Felting	Character	Description
R1/R1P	≥ 40 mm	≤ 25 µ	≥ 120 mm	≤ 60 µ	Distinct	≤ 3 %	≤ 0,3 %	Insignificant	Typical	White/pigmented, Lustrous, medullation-free, free from VM, and no sewn through staples
R2	≥ 40 mm		≥ 120 mm	≤ 90 µ		≤ 10 %	≤ 1,0 %	Slight felting accepted	Atypical accepted	White, coarser, medullation accepted, and almost free from VM. Crossbreeds

QUALITY U: BELLY AND BRITCH WOOL AND WOOL WITH VEGETABLE MATTER

Quality class	Length requirement	Vegetable matter	Felting	Description
U1/U1P	≥ 40 mm	≤ 10 %	Slight felting accepted	White/pigmented, belly and britch wool from autumn or year-round
U2	< 40 mm			White belly and britch wool from spring clip or other short wool
U3P				Pigmented belly and britch wool from spring clip, heavily medullated wool, high VM content, felted or urine-burned wool,
U4P			Cotted wool accepted	Cotted wool and wool from Dorper

^{*}Pigmenterad **Vegetabiliskt material

Descriptions

Here are detailed descriptions of the different quality classes, properties, and areas of use.

Wool of Stuffing Type

S1 is a white wool suitable for stuffing longer than 4 cm. The wool must have very good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. A Texel & Suffolk-like wool. Suitable for stuffing.

S2P is a pigmented wool Suitable for stuffing longer than 4 cm. The wool must have very good resilience. A certain amount of medullation is accepted, as well as some vegetable matter. Only slight felting that comes out in scouring is accepted. A Texel & Suffolk-like wool. Suitable for insulation and stuffing.

Wool of Swedish Finewool Type

F1 is a white wool of fine wool type longer than 4 cm. All wool fibres must have a fineness of 27 μ or less. The wool must be finely crimped and have good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. Spinnable. Svärdsjö wool of Swedish finewool type falls into this category.

F1P is pigmented wool with the same requirements as F1.

F2 is a white wool of Swedish finewool type with no length or strength requirements. All wool fibres must have a fineness of 27 μ or less. The wool must be finely crimped and have some resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. Atypical characteristics are accepted. Svärdsjö wool of Swedish finewool type and short merino wool may fall into this category.



Wool of Crossbred Type

C1 is a white wool of crossbred type longer than 7 cm. All wool fibres must have a fineness of 38 μ or less. The wool must have a distinct crimp and good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. Corresponds to Norway's class C1.

C1P is pigmented wool with the same requirements as C1. Corresponds partly to Norway's class C1.

C1L is a white wool of crossbred type with a full year fleece character, longer than 10 cm. All wool fibres must have a fineness of 38 μ or less. The wool must have a distinct crimp and good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. Easily spun wool suitable for carded yarn and blanket yarn that can be brushed, as well as for upholstery fabrics and worsted yarns. Corresponds to Norway's class A1.

C2 is a white wool of crossbred type longer than 4 cm, shorter than 7 cm. All wool fibres must have a fineness of 38 μ or less. The wool must have a distinct crimp and good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. More grease is accepted. Can be blended with C1 for making wadmal fabric. Corresponds to Norway's class B1.

C3 is a white wool of crossbred type shorter than 4 cm. All wool fibres must have a fineness of 38 μ or less. The wool must have a distinct crimp and good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. Suitable for felting.

C4 is a white wool of crossbred type longer than 7 cm. All wool fibres must have a fineness of 80 μ or less. A certain amount of medullation is accepted, as well as some vegetable matter and light felting. Atypical crossbred wool is accepted. Suitable for upholstery fabrics. Corresponds to Norway's class C2.

Wool of Merino Type

M1 is a white wool of merino type longer than 4 cm. All wool fibres must have a fineness of 22 μ or less. The wool must be finely crimped and have good resilience. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted.

M1P is pigmented wool with the same requirements as M1.

Wool of Pelt Type

P1 is a white wool of Pelt type with lamb character, longer than 7 cm. All wool fibres must have a fineness of less than 60 μ or less. The wool must have a distinct lustre. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. Suitable for lustrous and finer yarns. White Swedish finewool of gobelin type, Dalapäls, and Svärdsjö wool of Pelt type may fall into this category.

P1P is pigmented wool with the same requirements and uses as P1. Corresponds to Norway's class F1P. Pigmented Swedish finewool of gobelin type, Dalapäls, and Svärdsjö wool of Pelt type may fall into this category.

P2 is a white wool of Pelt type with adult sheep character, longer than 7 cm. All wool fibres must have a fineness of 60 μ or less. The wool must have a distinct lustre. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted.

P2P is pigmented wool with the same requirements and uses as P2. Corresponds partly to Norway's class F2P.

Wool of Wadmal Type

V1 is a white wool of wadmal type with spring wool character, rich in underwool with some guard hairs, longer than 4 cm. Underwool and guard hairs must be longer than 4 cm. The fineness must be 25 μ or less for the underwool and 60 μ or less for the guard hairs. Only insignificant amounts of medullation are accepted, as well as some vegetable matter. Only slight felting that comes out in scouring is accepted. A wool suitable for felting.

V1P is pigmented wool with the same requirements and uses as V1.

V2 is a white wool of the vadmal type with an adult sheep character, longer than 4 cm. The guard hairs and underwool should be longer than 4 cm. Medullated fibres are acceptable, as well as some vegetable matter. Light felting is allowed. It is suitable for coarse vadmal and tweed.

White wool of coarse type from breeds such as Värmlands sheep, Gestrike sheep, Helsinge sheep, and other native heritage breeds, as well as certain wool from Rya and Leicester, may fall into this class.

V2P is pigmented wool with the same requirements and uses as V2. Pigmented wool of coarse type from breeds like Gute, Värmland sheep, Gestrike sheep, Helsinge sheep, and other native heritage breeds, as well as some wool from Rya and Gotland sheep, may fall into this class.

Wool of Rya Type

R1 is a white wool of rya type, longer than 12 cm (guard hair) and 4 cm (underwool). The fineness must be 25 μ or less for the underwool and 60 μ or less for the guard hairs. The wool must have a distinct lustre. Only insignificant amounts of medullation and vegetable matter are accepted. Only slight felting that comes out in scouring is accepted. No sewn-through staple. Suitable for upholstery fabric and tapestry yarns. Corresponds to Norway's class F1.

R2 is white wool of rya wool type, longer than 12 cm (guard hairs) and 4 cm (underwool). The fineness of the guard hairs should be 90 μ or less. A certain amount of medullation is acceptable, as well as some vegetable matter. Light felting is allowed. Atypical wool is accepted. Suitable for rug yarn. Corresponds to Norway's class F2.

White Rya wool/crossbreeds, Dalapäls wool of rya type, and wool from Värmland sheep of rya type may fall into this class.

R2P is pigmented wool with the same requirements and uses as R2.

Belly and Britch Wool, and Wool with Vegetable Matter

U1 is a white out sorted belly and britch wool from an autumn or full-year fleece longer than 4 cm. Vegetable matter and light felting are accepted. Suitable for carpet yarn. Corresponds to Norway's class H1.

U1P is pigmented wool with the same requirements and uses as U1.

U2 is a white out sorted belly and britch wool from the spring clip or wool shorter than 4 cm. Some vegetable matter and light felting is accepted. Suitable for technical felt. Corresponds to Norway's class H2.

U3P is pigmented discarded belly and britch from the spring clip or wool with no length requirement. Heavily medullated wool, a high content of vegetable matter and urine-burned wool is accepted. Suitable for pellets and technical felt.

U4P is pigmented or discarded wool with no length requirement. Hard-felted or cotted wool and wool fibres from Dorper sheep are accepted.



The Swedish Wool Standard is a set of working methods and guidelines, including a classification system for Swedish wool. The standard aims to increase the quality of Swedish wool and to support the trading of wool on an industrial scale, by creating a common language among all the actors in the Swedish wool value chain - from farmers and shearers to wool brokers and buyers. The Swedish Wool Arena (Arena Svensk UII ekonomisk förening) manages the standard.

The standard has been developed by the project partners in The Swedish Wool Initiative (SWI) - a cross-sectoral collaboration run by Axfoundation and aiming at contributing to the vision of zero waste of Swedish wool. In SWI, a wide range of actors from across the value chain collaborate to build system capacity, scale up the use of Swedish wool and contribute to the transition to a sustainable and circular industry.

Partners in Swedish Wool Initiative Scale Up are Axfoundation, Dalarna Science Park, Arena Svensk Ull, Circularista (Linn Linfred), CTH Ericson of Sweden, Dalarnas Fåravelsförening, Filippa K, Fjällräven, Houdini Sportswear, Högskolan Dalarna, Insjöns Väveri, Klippan Yllefabrik, Linnea Eklund, Röyk, Science Park Borås,

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