



Wool Evaluation 101

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Wool evaluation is key for determining the value of a fleece. However, it can also be used when judging fleeces at wool shows and in wool judging competitions. Wool is evaluated based on traits that have the most influence on its value, including:

- **Grade:** Designation of wool fineness based on fiber diameter and the variation in fiber diameter.
- **Grease Fleece Weight:** The weight of a fleece after shearing before washing out the natural grease and other contaminants.
- **Clean Wool Yield:** The amount of clean wool after the fleece has been scoured (washed). Expressed as a percentage of the original weight (grease fleece weight).
- **Staple Length:** The length of an unstretched wool fiber or lock.

Fiber Diameter and Grade

The first thing to look at is grade, or fiber diameter, which is measured in microns (μm). Coarser fibers have a larger diameter (higher micron) and are worth much less than fine fibers. This trait predominately depends on breed; meat breeds (Suffolk, Dorset, etc.) have much coarser wool than wool breeds (Rambouillet, Targhee, etc.) Each breed has acceptable ranges of fiber diameter (e.g., Rambouillet: 21-22 micron). Fine wool (lower micron) is used in clothes worn close to your skin, whereas coarser wool (higher micron) is used in producing carpet or heavy coats. Ideally, all the fibers in the fleece need to be uniform in length and fiber diameter regardless of whether they are

fine or coarse. Wool grades are discussed in several ways: the American Blood system, the English or Spinning Count system, and the Micron system. The Blood grading system was originally based around the proportion of genetics of a sheep that was Merino. This grading system is used in youth wool judging contests because it is the broadest system of classifying wool, but not recognized by USDA grading standards. The Spinning Count system utilizes a measurement of how many hanks (560 yards) could be spun from one pound of that wool. As the spinning count increases, the micron decreases. In other words, finer wools have higher spin counts. This is the grading system used in collegiate wool judging contests. The micron system is the most precise method of grading as it objectively measures the average diameter of the fiber in microns (one millionth of a meter). Micron is the primary determinant of the base price of wool. Both micron and spinning count are recognized by USDA standards. The requirements for each grade are listed in Table 1.



Figure 1. A sample of 70's grade, fine wool that is high yielding (approximately 64%) with very little vegetable matter or dirt.

Table 1. Requirements for wool grades.

Wool Grade	American Blood Grade	Spinning Count	Range of Average Fiber Diameter (micron)	Yield	Length Requirement
Fine	Fine	Finer than 80's	<17.70	40-68%	≥3.00"
		80's	17.70-19.14		
		70's	19.15-20.59		
		64's	20.60-22.04		
	½ Blood	62's	22.05-23.49	40-70%	≥3.25"
		60's	23.50-24.94		
Medium	¾ Blood	58's	24.95-26.39	50-70%	≥3.50"
		56's	26.40-27.84		
	¼ Blood	54's	27.85-29.29	55-75%	≥4.00"
		50's	29.30-30.99		
Coarse	Low ¼ Blood	48's	31.00-32.69	55-75%	≥4.00"
		46's	32.70-34.39		
	Common	44's	34.40-36.19	55-75%	≥4.00"
		40's	36.20-38.09		
	Braid	36's	38.10-40.20	55-75%	≥4.00"
		Coarser than 36's	>40.20		

Determining the grade of a fleece can be done by spreading out a lock and looking at the individual fibers, but crimp and handle are also indicators of grade.

Crimp: The amount of crimp (curvature) that wool has can be an indicator of fineness. Locks with more crimps per inch tend to be finer while coarser fleeces look wavier or potentially have no crimp at all.

Handle: How soft a fleece feels to the touch is also known as its handle. Finer wools tend to be much softer due to lower rigidity of finer fibers. This is also an indicator of comfort factor or how comfortable the wool would be when worn as close-to-skin garments, such as base layers. Coarser fleeces have a harsher handle and don't feel as soft. Final products made with coarse wool are likely to be bulkier and have higher "prickle factor" or that stereotypical prickly feel.

Fleece Weight and Yield

The most important traits that are evaluated are the fleece weight and yield. Wool is priced on a clean weight basis (\$/lb), so heavier, higher yielding fleeces are optimal. When a judge lifts the fleece to see how heavy it is, they are also estimating the yield. Lower yielding fleeces will have drag, or they feel like someone is pushing down on them as they are lifted off the table. Dirt penetration is how deep dirt and debris carry down the lock. The farther down the lock the dirt penetrates, the lower the yield.

Placing fleeces based on weight and yield can be challenging. Dirt and other contaminants will make the fleece feel heavier, but lower yields mean less clean wool after it is processed, thus decreasing the value of that fleece. The greasy feel in wool is lanolin. Typically, the more lanolin in a fleece, the more dirt and vegetable matter stick to the fibers. When determining yield, a judge is estimating how much lanolin and other contaminants are in the fleece, and how much clean wool there will be after scouring (washing). A general rule of thumb is that finer fleeces are lower yielding because tighter crimp increases the surface area catching dirt and higher levels of lanolin hold on to dirt and contaminants. As a baseline, coarse fleeces (e.g., ¼ or low ¼ blood) have a yield of 55% or greater. Common contaminants that will decrease the yield are vegetable matter (hay), black or kemp fibers (these do not absorb dye), dirt, and polypropylene twine. Fleeces that are skirted (inferior wool and vegetable matter removed) tend to place higher due to increased yield.

Staple Length and Strength

The final characteristic that needs to be evaluated is staple length and strength. This is done by measuring the length of your middle finger and using it as a guide when pulling locks. Longer is always better when it comes to judging on staple length. Short staples are unusable at the mill as they are too short to be processed. In wool judging contests, every grade

has a length requirement. Length is described as “Staple”, “French Combing” or “Clothing” from longest to shortest. The length requirements for each staple length are listed in Table 2. Notice that wool that is a 3/8 Blood or higher does not have a “French Combing” classification.

From a commercial production standpoint, all fleeces must have a staple length of at least three inches. Health and nutrition of the sheep can impact the staple length. If a sheep runs a fever or is nutritionally stressed, this creates a weak spot in its wool fiber where it will break during processing. Strength is tested by pulling a lock of wool from a fleece, firmly gripping the lock on each end, and pulling in opposite directions. If the wool has a tender spot, the lock will break. Weak wool is a problem during manufacturing. When wool goes through the carding process, the locks will break and create noils, or short wool, that falls through the card and is waste. This decreases the overall clean yield of a wool clip and reduces the amount of product that can be made.



Figure 2. Example of 4.5” staple with distinct crimp design.

Table 2. Wool Judging Staple Length Requirements

Grade	Staple Length		
	Staple	French Combing	Clothing
Fine (64’s and Finer)	>3”	2-3”	<2”
1/2 Blood (60’s and 62’s)	>3.25”	2.25-3.25”	<2.25
3/8 Blood (56’s and 58’s)	>3.5”	N/A	<3.5”
1/4 Blood (50’s and 54’s)	>4”	N/A	<4”
Low 1/4 Blood (48’s and Coarser)	>4”	N/A	<4”

Other Characteristics to Consider

Uniformity: The more uniform in grade and staple length a fleece is, the more uniform the final product from that wool will be. It is common for a fleece to vary slightly in length and micron depending on its location on the sheep. Wool tends to be finer and shorter towards the head and neck and get longer and coarser towards the britch, or the back end of the sheep. The average length and grade is found in the middle, from the shoulder to the dock. Belly wool is typically removed from the fleece because it is short, low yielding, and more heavily stained. The presence of belly wool is a major discount if found in a fleece and largely influences overall uniformity. At least four locks should be pulled from different areas of a fleece to accurately assess its characteristics and uniformity.

Color: Bright white wool is going to be easier to scour and will more readily accept dyes when creating a final product. Wool that is stained (e.g., urine, paint, feces, etc.) will be harder to clean and can alter the final color after dyeing. Yellow appearing wool is often referred to as “yolky.” The bright yellow color is a result of excessive sweating and/or the presence of external parasites called keds. This yellowing may not be removed during the washing process. Although naturally colored wool can be used to create final products that are grey, brown, and black, white fleeces will be discounted if colored fibers are present. Colored fiber does not accept colored dyes and will alter the color of the final product.

Condition: Although it is usually not a major concern in wool evaluation, condition can still play a role when placing fleeces. It lacks the luster and visual appeal of a freshly shorn fleece and feels dry to the touch. If wool has been used repeatedly in judging practice or

contests, it will begin to lose condition within the first year. The dry, harsh handle of poor conditioned fleeces may alter how the evaluator perceives their grade.

Purity: The presence of fibers that will not accept dye are a purity concern when evaluating wool. As previously mentioned, this includes colored fibers. The type of fiber that is undesirable is referred to as kemp or medullated fiber. These fibers have a hollow center and often little to no crimp. Kemp is short and very coarse. Hair on the face and legs of sheep is medullated and should be removed from a fleece. When evaluating wool, the presence of kemp and colored fibers is a concern and should be discounted.



Figure 3. A sample of wool contaminated with medullated fibers (bright, white, ridged fibers).

The big picture of wool evaluation is recognizing a fleece's ability to be processed and created into end products. Accurately assessing wool characteristics takes practice but is integral in understanding its value. Whether judging competitively or gauging the quality of a commercial wool clip, the skill of identifying the characteristics and recognizing undesirable attributes promotes the improvement of the American wool clip. If you have questions on wool evaluation or wool judging teams, contact Jaelyn Quintana, SDSU Sheep Field Specialist at Jaelyn.Quintana@sdstate.edu or (605) 394-1722.



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