



Wool Production Basics

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Wool production begins with several basic concepts. Along with the fiber diameter, the fiber length, and the amount of vegetable matter and any other foreign material in the fleece affect wool quality. Fiber diameter varies by breeds of sheep and is used to determine the use of the wool. Wool made up of smaller diameter fibers or fine wool is used for clothing while wool made up of larger diameter fibers or coarse wool is used for carpets and rugs. Below are more details about wool production and wool quality.



Wool Yield

As wool comes off the sheep it is called grease wool. This is because the lanolin in the wool gives it a greasy feel and appearance. This wool also contains vegetable matter, dirt, and other impurities. Wool goes through a scouring process to remove the grease, dirt and other impurities, and a carbonization process to remove vegetable matter. The difference between the grease wool weight and the clean weight is the yield. In general, fine wool fleeces have a lower yield than medium and coarse wool fleeces. Much of this also depends on the amount of grease in the fleece. Expected yields range from 45% to 70%.

Fiber Diameter

Fiber diameter is probably the most important factor for determining the quality of wool and its value. As the fiber diameter increases, it changes the way wool is used. Larger diameter fibers do not work well in the felting process, but because they are stronger and less likely to break during the carding and combing process, they are very well suited for carpets and rugs. Small diameter fibers or fine wool are best suited for clothing and textiles.

Fiber diameter is used to determine the wool grade. The American system began by visually appraising the wool fibers. This system is known by the blood grade because it starts with the Merino breed and the wool from other breeds is graded according to the percentage of Merino in the breed. Table 1 shows the various wool grades using both the American Blood Grade system and the ASTM (American Society for Testing and Materials) standard grade. The number corresponding to the ASTM grade related to the number of 560 yard lengths of yarn that can be spun from one pound of top (clean wool).

**Table 1
Wool Grades**

American Blood Grade	ASTM Grade	Range for Average Fiber Diameter (micrometers)	Maximum Standard Deviation (micrometers)
Fine	Finer than		
	80s	Under 17.70	3.59
	80s	17.70 to 19.14	4.09
	70s	19.15 to 20.59	4.59
	64s	20.60 to 22.04	5.19
Half blood	62s	22.05 to 23.49	5.89
	60s	23.50 to 24.94	6.49
Three-eighths blood	58s	24.95 to 26.39	7.09
	56s	26.40 to 27.84	7.59
Quarter blood	54s	27.85 to 29.29	8.19
	50s	29.30 to 30.99	8.69
Low quarter blood	48s	31.00 to 32.69	9.09
	46s	32.70 to 34.39	9.59
Common	44s	34.40 to 36.19	10.09
	40s	36.20 to 38.09	10.69
Braid	36s	38.10 to 40.20	11.19
	Coarser than 36s	Over 40.20	



Crimp is another wool characteristic highly related to fiber diameter. Crimp is the waviness of the wool. High-crimp wools that are very uniform are normally the higher quality wools. However, wool with too much crimp can cause problems in the processing the same as wools with very little crimp. Low-crimp wools tend to tangle and felt during scouring while high crimp wools can form balls or “neps” during carding and combing.



Vegetable Matter

Vegetable matter in wool comes from feed particles as well as burs, seeds, twigs, leaves, and grasses. Vegetable matter is removed from a fleece using a process called scouring. A certain amount of vegetable matter is expected in wool, however, an excessive amount is considered a defect and the wool may be discounted in price.

Several ways to minimize the amount of vegetable matter in wool include the following: removing belly wool, wool on the top of the head and around the cheeks, and removing manure clumps or tags. Carefully feeding sheep to prevent contamination can also decrease the amount of vegetable matter in the wool.

Fiber Length and Strength

The staple or fiber length affects how the wool can be used. Very short fibers are used in the felting process. There are three classes of staple length: staple, French combing and clothing. The length of the wool fiber has a direct effect on spinning speed, yarn count and yarn quality. While there are no official specifications for fiber length, the American Sheep Industry Directory suggests the following in Table 2.



**Table 2
Staple Length Requirements by Grade**

Grade	Staple	French Combing	Clothing
64/70s	2 3/4" and longer	1 1/4 " to 2 3/4"	Less than 1 1/4"
60/62s	3" and longer	1 1/2" to 3"	Less than 1 1/2"
56/58s	3 1/4" and longer	2 1/4" to 3 1/4"	Less than 2 1/4"
50/54s	3 1/2" and longer		Less than 3 1/2"
46/48s	4" and longer		Less than 4"
36/40/44s	5" and longer		Less than 5"

The strength of fibers is also important. A change in the nutrition or health of sheep can affect the strength of a wool fiber. The strength of the individual fibers will then affect the strength of the yarns. Weak fibers that break during processing can also increase the number of noils or short fibers. Fibers that break will then increase the amount of waste during processing. The position of the break in the fibers is also important because a break in the middle has a larger impact on how the fiber can be used than if that break is near the end of the fiber. You can check the strength of fibers by pulling a small amount of wool from a fleece and pulling sharply several times. If the fibers break, you obviously have weak fibers.

Fiber Color

The whiteness of wool is very important if the fibers are not expected to be dyed or will be dyed a light color. Very white wool fleeces come from fleeces that have been skirted to remove any urine or feces stained wool. Producers who wish to market a very high quality wool keep their sheep covered year-round to prevent contamination and discoloration of the wool. The presence of colored fibers in wool has an affect on the price of that wool also due to limiting the uses for the wool. These fibers can come from the sheep themselves, either dark fibers in the wool or from head, belly or legs. They may also come from stained wools. Colored wools from natural colored sheep are generally a specialized market for people who spin or weave by hand. Sold to a mainstream market, these wools are discounted because of their limited use in the dyeing process.

Cotted or Felted Fleeces

Occasionally, the wool fibers may become matted or felted together. This occurs when fine fibers have very little crimp. Cotted or felted fleeces are considered low quality because of the amount of waste produced during carding due to breaking the fibers when they are torn apart. Fine wool sheep that have very little crimp should be culled.

Improving Wool Quality

Wool quality can be affected by genetic and environmental influences. Genetic influences would be to select sheep with higher quality wool, while environmental influences might include nutrition, sheep management, and shearing management.

Genetic selection should consider which traits are more heritable or more likely to pass to the lambs. Traits that are highly heritable include variation in fiber diameter, face covering, staple length, crimps and skin folds. Traits that are moderately heritable include fleece weight, clean wool yield, fiber diameter, and fiber density. Another factor that relates to wool production is body weight because larger sheep have more surface area to produce wool. Thus, large sheep

produce more wool than small sheep.

The environment can influence wool quality in a number of ways. First is the nutrition of the sheep. Ewes tend to be stressed during the last third of their pregnancy and while nursing lambs. This has a direct effect on the fiber diameter that is being produced. As the nutritional level of the ewe meets her needs or is above what her needs are, the fiber diameter remains constant. As the ewe becomes stressed in the latter stages of pregnancy and after lambing, that fiber diameter may decrease which creates weak areas that are susceptible to breaking. Two ways to minimize a decrease in wool quality are to make sure ewes are eating a ration that meet their needs and to shear ewes prior to lambing. If the fibers do have weak areas, the weakness is closer to an end of the fiber than if the ewes had long wool at lambing and weren't sheared until after weaning. It is also a good practice to have ewes in short wool at lambing time as lambs are less likely to suckle wool tags instead of the teat.

As mentioned previously, feeding management will affect the quality of wool if large amounts of feed contaminate the wool. Feeders should be low enough for sheep to eat without pulling hay down on top of their heads. Also, when feeding avoid throwing hay over the backs of the sheep.

In addition to what the animals eat is the consideration of bedding materials. Animals should be bedded often enough to keep them clean. In addition, use materials that are clean, dry, and free from dust. Another consideration, especially if you use straw, is to look for weed seeds that will stick in the wool such as burdock.

Summary comments

Wool production is often overlooked in many operations. For the average person marketing their wool through a wool pool, special considerations for wool production may not be warranted. However, if you are raising wool sheep with high quality wool, you will want to take every precaution you can to maintain the highest quality of wool possible. When you find the correct market, wool production can be quite profitable.

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