Are Hair Sheep Meat Sheep?

A Project to Determine if Carcass Composition is Influenced by Hair Sheep Breeding

by Dr. Debra K. Aaron, University of Kentucky

Sheep are generally considered multi-purpose animals, producing meat, wool and milk. However, most sheep breeds are best suited to only one purpose—either meat or wool or milk—and are classified accordingly: Meat breeds, wool breeds, dairy breeds. Meat breeds are often further categorized as either sire breeds (for example, Hampshire) or maternal breeds (for example, Polypay). Sometimes breeds are referred to as general or dual purpose, having adequate amounts of muscling along with acceptable maternal characteristics. Then we speak of hair breeds (for example, Katahdin, Dorper/White Dorper). Classified according to purpose or marketable commodity, hair sheep must be meat sheep. But, how does their carcass merit compare with traditional wool meat breeds?

About the Project

Producer interest in hair sheep breeds has increased dramatically over the last 15 years. Hair sheep numbers have risen accordingly. The latest NAHMS Sheep Study (USDA, May 2012) reported that approximately 22% of all sheep operations in the U.S. were using hair breeds. In 2013, based on number of registrations by purebred associations (The Banner, March 2014), two composite (or improved) hair breeds were among the five most popular sheep breeds in the U.S. For the first time ever, a hair breed, the **Katahdin**, ranked first in popularity. It was followed closely by Hampshire (2nd), Suffolk (3rd), **Dorper/White Dorper** (the other hair breed, 4th) and Dorset (5th).

There are several reasons behind the increased use of these two composite hair breeds in U.S. production systems. The first, and most obvious reason, is that hair sheep do not have to be sheared, naturally shedding coats (mixtures of hair and wool fibers) in late spring and summer. This is a selling point for many producers, given increased shearing costs and decreased prices for the medium wools that are characteristic of most U.S. meat breeds. Second, these composite hair breeds are more resistant or tolerant to internal parasites (in particular, *Haemonchus contortus*) than most wool sheep breeds, giving them a reputation as being "easy care" sheep. This is a big advantage in most producers' minds because anthelmintic resistance continues to build and drenching with traditional dewormers is becoming less and less effective. Third, these hair breeds are generally recognized for high lamb and ewe vigor. In addition, they are noted for their efficient use of forage. All these reasons are valid, but what about lamb growth? Muscling? Carcass merit? After all, the one and only commodity being produced and marketed is meat. So, how do these composite hair breeds measure up to traditional U.S. meat breeds when it comes to the production of lean lamb? **Is carcass composition influenced by hair sheep breeding?**

This was one of the primary questions of interest to sheep researchers at the University of Kentucky in 2002 when Polypay ewes were exposed to White Dorper rams in the first phase of a long-term breeding project designed to grade-up to the White Dorper breed. The Polypay, a traditional white-faced, medium-sized, wool breed, was chosen as the foundation because of its outstanding maternal characteristics and ability to produce lambs with good growth and carcass quality. The White Dorper was chosen as the hair breed to grade up to because of its reputation for heavy muscling and high carcass quality. The White Dorper is not parasite resistant, but does have increased tolerance to parasites as compared to wool breeds. Its growth rate, while slower than traditional fast-growing meat breeds, like the Hampshire, is acceptable and reported to be faster than other hair sheep breeds. However, because the White Dorper is an early maturing breed, lambs

are expected to finish at lighter weights than traditional wool meat breeds.

Getting Started

In the fall of 2002, a foundation flock of Polypay ewes was mated to Polypay and White Dorper rams, in equal numbers, to produce Polypay and White Dorper x Polypay offspring. Selected F_1 (White Dorper x Polpay) ewe lambs subsequently entered the flock and were exposed to White Dorper rams. Contemporary Polypay ewe lambs and foundation Polypay ewes, retained on the basis of productivity, were mated to Polypay and White Dorper rams. This grading up mating scheme continued for 10 years, producing Polypay (**PP**), 1/2 White Dorper x 1/2 Polypay (**1/2 WD**), 3/4 White Dorper x 1/4 Polypay (**3/4 WD**), 7/8 White Dorper x 1/8 Polypay (**7/8 WD**) and 15/16 or higher White Dorper (**WD**) lambs. Producing contemporary lambs of each genetic type enabled researchers to measure changes in production traits as breed composition evolved from Polypay to White Dorper.

> Producers grading up to the White Dorper would not continue to produce intermediate crosses each year. Instead, they would mate White Dorper rams to Polypay ewes and their crossbred female offspring generation after generation until the flock consisted of "purebred" White Dorpers.

This portion of the project compared carcass characteristics of a random sample of wether lambs produced from 2003 through 2010. Overall, carcasses were harvested from 233 lambs varying in the percentage of White Dorper breeding from zero to over 93.75% (**PP**: 50; **1/2 WD**: 50; **3/4 WD**: 50; **7/8 WD**: 35; **WD**: 48).

Collecting the Data

Lambs were born in April each year, creep fed on pasture and weaned at an average age of 70 days. After weaning, lambs were managed on pasture under typical Kentucky conditions and supplemented with grain at 2 to 3% body weight. As lambs reached a live target weight of 120 lb, they were sent to the University of Kentucky Abattoir where they were weighed and carcasses harvested following normal industry practices. Carcasses were weighed prior to chilling. Dressing percentage was calculated by dividing hot carcass weight by live harvest weight. Carcasses were chilled for 24 hr and ribbed between the 12th and 13th ribs before carcass measurements were taken. All carcass measurements were made by University of Kentucky Abattoir personnel. Fat thickness was measured between the 12th and 13th ribs over the center of the *longissimus dorsi* (loin eye). Body wall thickness was measured across the lean, bone and fat of the lower rib, approximately 5 inches off the carcass midline. Loin eye area was measured at the 12th rib. Yield grades were assigned according to USDA standards. Wholesale cuts were weighed and the percentage of boneless, closely trimmed retail cuts was estimated from carcass weight, fat thickness, body wall thickness and loin eye area.

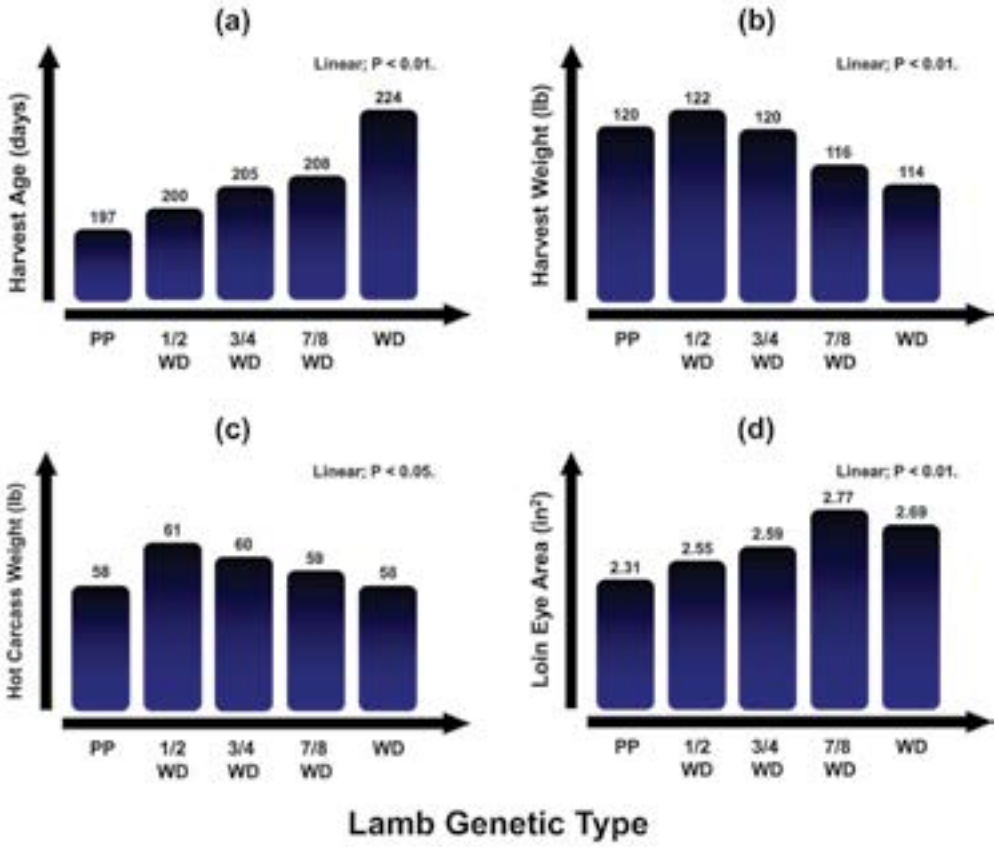

Figure 1. Averages for harvest age (a), harvest weight (b), hot carcass weight (c) and loin eye area (d) by lamb genetic type (PP = Polypay, WD = White Dorper).

Traits analyzed statistically included age at harvest, harvest (or final) weight, hot carcass weight, dressing percentage, fat thickness, body wall thickness, loin eye area, wholesale cut weights, yield grade and estimated percentage of boneless, closely trimmed retail cuts. All carcass composition traits were statistically adjusted so comparisons would be based on carcasses of similar weight. Differences and trends were determined to be statistically significant if the probability level was either 1% or 5%. This simply means that, for this project, the risk of an observed difference or trend being due to chance, and not real, was either 1 or 5%.

The Results

At Harvest

Average age at harvest is shown in **Figure 1(a)** for **PP**, **1/2 WD**, **3/4 WD**, **7/8 WD** and **WD** lambs. **PP** lambs were the first (197 days) to reach the live target weight of 120 lb. After that, as percentage White Dorper breeding increased from 50% (**1/2 WD**) to over 93.75% (**WD**), average age at harvest increased significantly in straight line fashion. **WD** lambs were the oldest at harvest. Directly comparing "purebreds," **WD** were significantly older than **PP** (224 *versus* 197 days).

Trend in harvest weights is illustrated in **Figure 1(b)**. On the average, **PP**, **1/2 WD** and **3/4 WD** met the live target weight. Of these lambs, **1/2 WD** slightly exceeded the target weight, weighing 122 lb when slaughtered. As percentage White

Genetically Speaking continues on pg. 20

Genetically Speaking continued from pg. 19

Dorper breeding increased, average harvest weights decreased significantly in straight line fashion. Lambs of 87.5% and higher White Dorper breeding had not met the target weight by the time of slaughter. These results indicate White Dorper lambs should be slaughtered earlier at lighter weights. This is not surprising given that the White Dorper is reported to be an early maturing breed. Directly comparing **WD** and **PP**, **WD** lambs were lighter but older than **PP** lambs (114 lb at 224 days *versus* 120 lb at 197 days). Keeping **WD** lambs on feed the additional 27 days, as compared to **PP**, was an inefficient use of feed resources and did not promote the additional gain necessary to meet the 120-lb live target weight.

Hot carcass weights [**Figure 1(c)**] followed the same general pattern as harvest weights, but there was less variation among lamb genetic types. Heaviest carcasses were produced by **1/2 WD** with weights decreasing as percentage White Dorper breeding increased. Both **PP** and **WD** carcasses weighed 58 lb. Representative carcasses are shown in **Figure 2**. When hot carcass weights [**Figure 1(c) pg. 19**] were divided by harvest weights [**Figure 1(b) pg. 19**], the resulting dressing percentages were 49.2, 50.0, 50.0, 50.9 and 50.9%, going from one "purebred" to the other (**PP** to **WD**). The slightly lower dressing percentage for **PP** may be explained by the difference between lambs covered in all wool to mostly hair as the percentage of White Dorper breeding increased.

Carcass Evaluation

Carcasses were further evaluated to determine differences in composition. Average loin eye area increased significantly in straight line fashion **[Figure 1(d) pg. 19]** as percentage White Dorper breeding increased from zero **(PP)** to over 93.75% **(WD)**. On the average, **PP** had the smallest loin eyes (2.31 in^2). In comparison, **WD** which had loins significantly larger loin eye (2.69 in^2). On the average, **PP** had the smallest loin eye (2.31 in^2). In comparison, **WD** had a significantly larger loin eyes (2.60 in^2). Loin eye area is an objective measure of muscling and differences in loin eye areas reflect differences in muscling within the carcass. Therefore, these results add evidence to reports that White Dorpers are a muscular, carcass breed.

Average weights for the four major wholesale cuts (loin, rack, leg and shoulder) are shown in **Table 1**. The highest priced wholesale cut is the loin. Average loin weights increased linearly as percentage White Dorper breeding increased. When comparing the two purebreds, there was a significant difference in favor of **WD**, which had a loin 0.7 lb heavier than that of **PP**. Similar results were seen for the second highest wholesale cut, the rack. Again, weights increased linearly; on the average, **WD** had racks significantly heavier than that of **PP** (4.7 vs 4.4 lb). Interestingly, leg weights did not differ significantly across lamb genetic type, averaging 16.4 lb overall. Based on visual appraisal of live lambs, it was expected that **WD** would have a heavier leg than **PP**. Although this was not the case, there appeared to be a difference in leg shape between the **WD** and **PP** when carcasses were visually appraised. This was purely subjective, however, and not analyzed statistically. Average shoulder weights followed a different pattern to the other wholesale cuts. As percentage of White Dorper breeding increased, shoulder weights significantly decreased in straight line fashion, with **PP** having the heaviest shoulder (13.3 lb) and

Figure 2. Representative carcasses (left to right) of Polypay, White Dorper and 1/2 White Dorper lambs; corresponding harvest and carcass weights are 130 and 61, 134 and 63, and 135 and 65 lb.

Lamb Genetic Type	No.	Wholesale Cut			
		Loin[L,Q]	Rack[L]	Leg	Shoulder[L]
PP	50	5.2	4.4	16.3	13.3
1/2 WD	50	5.9	4.5	16.6	12.7
3/4 WD	50	6.2	4.9	16.5	12.4
7/8 WD	35	6.3	4.8	16.4	12.5
WD	48	5.9	4.7	16.4	12.3

[L]Linear, P < 0.01; [Q]Quadratic, P < 0.01.

Table 1. Average wholesale cut weights (lb) by lamb genetic type (PP = Polypay, WD = White Dorper).

WD the lightest (12.3 lb). This trend fit visual observations made on the live animals.

Yield-related traits (fat thickness, yield grade, body wall thickness and estimated percentage of boneless, closely trimmed retail cuts) are summarized in **Table 2**. Fat thickness, measured between the 12th and 13th ribs, increased in straight line fashion as percentage of White Dorper breeding increased, with **PP** and **1/2 WD** lambs having the least back fat and **3/4 WD**, **7/8 WD**, and **WD** having the most. Trying to take **WD** to the same live target weight resulted in them putting on more finish than **PP**. Yield grades (YG 1 = highest expected yield; YG 5 = lowest expected yield) reflect differences in fat thickness. This is logical because fat thickness is the measure used to assign yield grades. Body wall thickness, another measure of fatness or finish, follows the same pattern as rib fat measurements and yield grades. The final measure, estimated percentage of boneless, closely trimmed retailed cuts, unlike the other indicators of lean yield, showed no significant trend, averaging 47.9% across lamb genetic types.

Lamb Genetic Type	No.	Trait			
		Fat Thickness (in)[L,Q]	Yield Grade[L,Q]	Body Wall Thickness (in)[L]	Percent Boneless Retail Cuts (%)
PP	50	0.18	2.2	0.60	47.5
1/2 WD	50	0.18	2.3	0.59	48.1
3/4 WD	50	0.22	2.6	0.64	47.8
7/8 WD	35	0.24	2.8	0.65	48.1
WD	48	0.22	2.4	0.71	47.9

[L]Linear, P < 0.01; [Q]Quadratic, P < 0.01.

Table 2. Averages for yield-related traits by lamb genetic type (PP = Polypay, WD = White Dorper).

Are Hair Sheep Meat Sheep?

Results of this project show carcass composition is influenced by hair sheep breeding. In general, as percentage White Dorper breeding increased from zero (Polypay) to over 93.75% (White Dorper), measures associated with lean meat production showed favorable changes (for example, larger loin eye muscles, heavier loins and racks). When directly compared to Polypay lambs, White Dorper lambs were older and lighter at harvest. However, at similar carcass weights, White Dorper lambs were meatier and had slightly more finish. Overall, these results show that White Dorper lambs do produce acceptable carcasses but suggest they should be harvested at younger ages than Polpay lambs and at weights less than 120 lb in order to maximize efficiency of production. Finally, our question was: ***Are hair sheep meat sheep?*** Results from this project show the answer is ***Yes***, at least when White Dorper is the hair breed in question.

Dr. Debra K. Aaron, PhD, *professor in the UK Dept. of Animal Sciences, teaches animal science and genetics. Her research interests are in sheep and genetic breeding.*