

Comparing Rate of Growth of Singles, Twin, Triplets, Ram & Ewe Lambs Out of Ewe Lambs & Mature Ewes:

What are the best ways to do it?

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Editor's Note: An earlier version of this article was published in the Fall 2009 issue of the Katahdin Hairald. The KHSI NSIP Committee suggests that it is time to revisit the article.

Have you wondered how to legitimately compare the growth rate of a single ram lamb raised by a yearling to a twin ram lamb raised by 4 year old ewe? Is this single born and raised ram lamb that is 20 pounds heavier than the rest of his cohort going to pass on genetics for more growth? The "non-genetic" effects of sex of the lamb, number born and raised, and the age of the ewe are significant.

Shepherds who pick the fastest growing lamb to 60 days of age or the biggest ram lamb at 120 or 150 days of age are often selecting single born ram lambs raised by a mature ewe. So, how do we tell if these heavier lambs are genetically superior for growth?

The environmental effect of the age of the ewe on volume of her milk production is not genetic and clouds the picture when the shepherd wants to identify genetics for growth. The environmental effect of being raised as a single, twin or triplet is not genetic and also makes it more difficult to identify genetics growth.

There are two ways that sheep breeders can "adjust" the 60 day weight of a lamb to remove the non-genetic effects of ewe age, number born/raised and sex of the lamb.

These include:

- Submitting data to the National Sheep Improvement Program and receiving EBVs (Expected progeny differences)
- Using the adjusted weight formula.

The adjusted weight formula is a part of the calculations used to derive EPDs. EPDs are more powerful since they incorporate the performance of relatives, allow comparison between flocks, and adjust for moderate and high input management systems. EPDs also separate genetics for growth from genetics for milk production, which is helpful in selecting superior breeding stock. A twin lamb raised by a ewe with genetics for very high milk production and moderate growth genetics can be just as heavy at 60 days as a twin lamb with superior growth genetics and raised by a ewe with below average milk production.

In 2003, enough data (thousands of records) had been collected by the Katahdin flocks in the National Sheep Improvement Program (NSIP) for Dr. David Notter of Virginia Tech to calculate the Katahdin specific adjustment factors. The adjustment factors are in Table 1. Age and sex of lambs should be fairly self-explanatory. Birth/Raise type may be less familiar but the general pattern is as follows:

- a) triplet born & raised is 3/3
- b) triplet born and single raised is 3/1
- c) single born/raised is 1/1
- d) ewe with a single in which a 2nd lamb is grafted on is ½

Table 1. Multiplicative Factors to Adjust Katahdin Weaning Weights for Type of Birth and Rearing and Ewe Age

Adult (3-6 yr old) ewes rearing single ewe lambs are the base (1.00)

Lamb Sex	Age of Dam	Type of Birth/Rearing						
		1/1	1/2	2/1	2/2	3/1	3/2	3/3
Ewe Lamb	1	1.17	1.43	1.31	1.49	1.35	1.60	1.81
	2	1.03	1.23	1.13	1.27	1.17	1.30	1.45
	3-6	1.00	1.14	1.05	1.17	1.08	1.23	1.38
	7 or >	1.01	1.20	1.10	1.23	1.13	1.25	1.44
Ram Lamb	1	1.06	1.30	1.19	1.36	1.23	1.46	1.65
	2	0.94	1.12	1.03	1.16	1.06	1.18	1.32
	3-6	0.91	1.04	0.96	1.06	0.98	1.12	1.26
	7 or >	0.92	1.09	1.00	1.12	1.03	1.14	1.31
Wether Lamb	1	1.12	1.37	1.26	1.43	1.30	1.54	1.74
	2	0.99	1.18	1.08	1.22	1.12	1.25	1.39
	3-6	0.96	1.09	1.01	1.12	1.04	1.18	1.32
	7 or >	0.97	1.15	1.06	1.18	1.08	1.20	1.38

The formula for making adjustments to weight data has been available for many years. It is a very useful tool that can be used by breeders not in NSIP or can be used along with EPDs in some selection programs.

The adjustment factors allow the breeder to adjust weaning weights for age of ewe, sex of lamb, number born and number raised, so that the performance/growth rate of lambs from different ewes can be compared regardless of sex of lamb, age of ewe or number raised. Since the age of each lamb is slightly different when weighing, one must also adjust each lamb weight to a standard age. The following formulas are taken from American Sheep Industry SID Sheep Production Handbook and are basically the same as those used in other countries (Figure 1).

The process for adjusting the weights of your lambs to a standard follows. It is a two-step process.

- A) First you need to adjust for the age (in days) at weighing. You don't have to weigh all lambs exactly at 60 days of age. You can weigh them all on the same day and then adjust to your standard age. For example if you weigh your lambs and they range in age from 45-75 days, you can adjust all to 60 days.
- B) The second step is to apply the adjustment factor that corrects all lambs to the same standard, no matter if they are a triplet, twin or a single born to a 4 year old or a 1 year old ewe.

The example provided in the box is a 60-day weight for a twin ewe lamb raised by a 1 year old ewe. The adjustment factor is taken from Table 1.

Figure 1. Age Adjustment Calculations

$$\text{Age Adjusted WT} = \left[\frac{\text{Actual WT} - \text{Birth WT}}{\text{Age when weighed}} \times \text{Adjustment Age} \right] + \text{Birth WT}$$

A ewe lamb weighed at 66 days, born and raised a twin to a yearling ewe. Weighed 45 lbs., 7.5 Birth WT.

$$\text{Age Adjusted WT} = \left[\frac{45 \text{ lbs} - 7.5 \text{ lbs}}{66 \text{ days}} \times 60 \text{ days} \right] + 7.5 \text{ lbs.} = 42.1 \text{ lbs.}$$

Adjusting for age of dam, number born/raised, and sex of lamb.

Using table #1:

Select sex of lamb = ewe

Select age of dam = 1

Select born/raised = 2/2

Resulting ADJ Factor 1.49

$$\begin{aligned} \text{Adjusted 60 day WT} &= \text{Age Adjusted WT} \times \text{ADJ Factor} \\ &= 42.1 \text{ lbs.} \times 1.49 \\ &= 62.7 \text{ lbs} \end{aligned}$$

Using a calculator for this formula is tedious and would require hundreds of numbers keyed in to calculate the adjusted wt for a handful of lambs. Developing a computer spreadsheet do the calculations also takes a fair amount of work. However, Richard Stewart, a Katahdin breeder in Kansas, has developed an Excel spreadsheet that is pretty easy to use. It can be downloaded from the Forms page of the KHSI Website (www.katahdins.org)

In Table 2, the weight of 5 lambs born within two weeks of each other and raised in the same pasture is adjusted for age, sex, birth/raise type and age of ewe. The lambs vary in weight by 25 lbs. The table is arranged in with the heaviest lamb ranked at the top and the lightest lamb in the bottom row. After adjusting the lambs for age, 4 of the 5 lambs are within 5 pounds of each other with the small ewe lamb from the yearling ewe significantly lighter. After adjusting for birth/ raise type and sex, the two heavier ram lambs are predicted to have the least genetics for growth.

Table 2. Comparison of Ranking by Raw Wt and Ranking by Adjusting Wt for Age, Birth/Raise type and Sex

Lamb #	ADJ WT Rank	Raw WT Rank	Dam Age (YRS)	DOB	SEX	#born/raised	Birth WT	Weigh Date	Age at Weighing	Raw WT	Age ADJ WT	Lamb ADJ WT
1	4	1	4	3/1/2009	R	1/1	9.00	5/8/2009	68	72	64.6	58.8
4	5	2	4	3/11/2022	R	2/1	8.25	5/8/2009	58	67	59.7	57.3
2	1	3	2	3/5/2022	E	2/2	8.00	5/8/2009	64	60	60.7	77.1
3	3	4	5	3/8/2022	R	3/3	7.50	5/8/2009	61	58	60.2	75.8
5	2	5	1	3/15/2022	E	2/2	7.50	5/8/2009	54	47	51.3	76.4

Note that these two lambs were single-raised on mature ewes. The triplet-raised ram lamb, twin ewe lamb from a 2 yr old ewe, and the small twin ewe lamb raised by the yearling ewe are ranked the highest.

Table 2 documents the importance of using adjusted weights as a key tool to help identify superior genetics. EPDs which include adjusting for these same factors are also an important tool. Acknowledgements: Dr. Dave Notter and his lab at Virginia Tech (Drs. Larry Kuehn & Bindu Vanimisetti) are thanked for calculating the Katahdin specific adjustment factors. We also thank Richard Stewart for allowing Katahdin breeders to use his program for adjusting 60 day weights with Katahdin specific adjustment factors.