There ***IS*** a Financial Incentive to Select for Increased Muscle!

American Sheep Industry Association

Genetics Forum

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NSIP's Mission

To provide predictable, economically important genetic evaluation information to the American sheep industry by converting performance records into relevant decision-making tools.

Impact of EBVs

ASI Let's Grow Study – "The Mickel Project" – proved EBVs translate into real life production scenarios.

We've seen examples of how growth EBVs can increase pay weights, and how maternal EBVs can impact a flock's performance for generations.

A Common Refrain

"Packers don't pay me for increased muscling."

They do.

Indirectly.

…if you're selling lambs on carcass weight.

↑PEMD = ↑Dressing% = ↑Money

We'll use this study to walk through the numbers…

B-mode, real-time ultrasound for estimating carcass measures in live sheep: Accuracy of ultrasound measures and their relationships with carcass yield and value[1,2]

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Muscle Measurement & EBV Abbreviations

NSIP EBV PEMD

Post-weaning Eye Muscle Depth

Measured & reported in millimeters (mm)

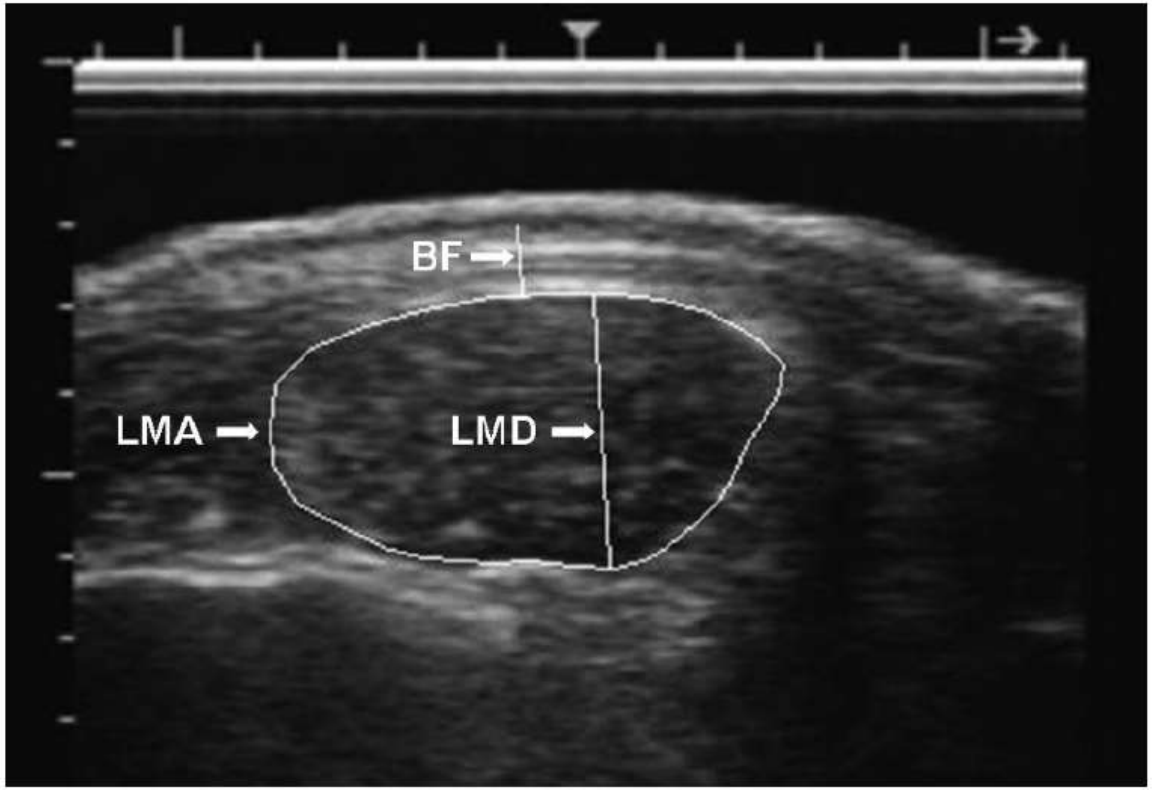

Figure 1. Transverse ultrasound image, taken between the 12th and 13th ribs, and technician interpretation of backfat thickness (BF), LM area (LMA), and LM depth (LMD).

Abstract Takeaways

ABSTRACT: Accuracy and repeatability of live-animal ultrasound measures, and the relationships of these measures with subprimal yields and carcass value, were investigated using data from 172 wethers. Wethers were F_1 progeny from the mating of 4 terminal sire breeds to Rambouillet ewes and were finished in a feedlot to a mean BW of 62.9 kg (SD = 9.5 kg). Before transport to slaughter, LM area, LM depth, and backfat thickness were measured from transverse ultrasound images taken between the 12th and 13th ribs. After slaughter, these measures were taken on each carcass. Carcasses were fabricated into subprimal cuts, and weights were recorded. Ultrasound accuracy and repeatability were assessed using bias, SE of prediction, SE of repeatability, and simple correlations. Relationships among ultrasound and carcass measures, and between these measures and carcass yield and value, were evaluated using residual correlations and linear prediction models. Ultrasound bias approached 0 for LM area, and backfat thickness was overestimated by only 0.69 mm. The SE of prediction and r were 1.55 cm^2 and 0.75 for LM area, and 1.4 mm and 0.81 for backfat thickness, respectively. The SE of repeatability was 1.31 cm^2 and 0.75 mm for LM area and backfat thickness, respectively. At a standardized BW and backfat thickness, wethers with larger LM area and LM depth yielded larger and more valuable carcasses, and these relationships were detectable with ultrasound. For each SD increase in carcass LM area, dressing percentage increased 1.57 percentage points, gross carcass value increased US$5.12, and boxed carcass value increased US$6.84 ($P < 0.001$). For each SD increase in ultrasound LM area, dressing percentage increased 0.95 percentage points, gross carcass value increased US$3.15, and boxed carcass value increased US$3.86 ($P < 0.001$). When LM area effects were adjusted for carcass weight, the response in boxed carcass value attributed to disproportionate increases in high-value subprimal cut weights was small. Associations of dressing percentage and carcass value with ultrasound and carcass LM depth were significant ($P < 0.01$) but smaller than corresponding associations with LM area. These data indicate biological and economical incentives for increasing LM area in wethers, and live-animal ultrasound can provide reliable estimates of carcass measures. These results are applicable to terminal sire breeders and producers who market sheep using carcass-merit pricing systems.

Key words: backfat thickness, carcass yield, longissimus muscle area, sheep, ultrasound

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1cm↑LD = 3.161%↑in dressing percentage

In NSIP Values, 1mm increase = 0.316% increase

Table 7. Estimates from models using off-test BW and ultrasound or carcass measures of backfat thickness (BF) and LM area (LMA) or LM depth (LMD) as predictors of dressing percentage and carcass value[1]

		Partial regression coefficient					
Method and type of measure	Intercept[2]	Off-test BW, kg	BF, cm	LMA, cm^2, or LMD, cm	Sire breed effect	Residual SE	R^2
Ultrasound LMA and BF							
Dressing percentage, %	52.39	0.0201	1.584	0.4728***	*	1.904	0.42
Gross carcass value,[3] US$	172.4	2.726***	3.631	1.567***	**	6.758	0.95
Boxed carcass value,[4] US$	179.5	2.855***	5.315	1.919***		7.904	0.94
Carcass LMA and BF							
Dressing percentage, %	52.67	−0.0524	2.340*	0.6717***	*	1.785	0.49
Gross carcass value,[3] US$	173.6	2.447***	10.46***	2.196***	***	6.236	0.96
Boxed carcass value,[4] US$	181.0	2.486***	12.55***	2.935***		7.055	0.95
Ultrasound LMD and BF							
Dressing percentage, %	52.38	0.0193	1.260	3.161**	**	1.924	0.40
Gross carcass value,[3] US$	172.1	2.776***	4.289	7.553**	***	6.945	0.95
Boxed carcass value,[4] US$	179.1	2.927***	6.241	8.700**		8.169	0.94
Carcass LMD and BF							
Dressing percentage, %	52.52	−0.0159	1.699†	3.632***	**	1.813	0.47
Gross carcass value,[3] US$	173.0	2.598***	8.389**	10.96***	***	6.408	0.96
Boxed carcass value,[4] US$	180.0	2.715***	9.581**	13.65***	†	7.464	0.95

[1]Model: $y = \mu$ + off-test BW + sire breed + BF + LMA (or LMD).
[2]Intercept values are the predicted response for the mean off-test BW, BF, and LMA or LMD.
[3]Gross carcass value = chilled carcass weight × gross carcass price (Table 1).
[4]Boxed carcass value = ∑(cut weight × item price from Table 1).
†$P \leq 0.10$; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Example: Shropshire Stud & Clean-up rams

	BWT		WWT		PWWT		PFAT		PEMD		Carcass+		SRC		PFEC		NLB		NLW		MWWT		US Maternal
Top Individual 0%	1.1		6.2		10.4		1.6		3.3		192		122		-82		9.3%		2.5%		0.41		102
Top 10%	0.3		3.0		5.6		0.0		2.2		152		112		-59		0.9%		0.0%		0.11		100
Top 25%	0.2		2.3		4.3		-0.6		1.7		141		109		-43		-1.0%		-1.1%		0.02		100
Top 50%	0.0		1.3		2.8		-1.5		1.1		127		104		-10		-2.2%		-2.3%		-0.10		99
Bottom 25%	-0.1		0.5		0.8		-2.1		0.5		117		100		36		-4.0%		-3.2%		-0.22		98
Bottom Individual 0%	-0.6		-2.0		-4.7		-5.7		-1.6		87		84		330		-8.5%		-5.9%		-0.69		96
ID																							
19RK9081	0.1	90	2.9	88	7.2	91	-3.8	90	1.7	92	167	90	118	66	-70	85	-2.0%	46	-1.7%	39	0.24	61	100.1
19FG6421	-0.2	82	0.5	82	0.1	84	-0.6	81	1.9	84	126	82	101	59	28	69	-6.1%	44	-3.3%	38	-0.30	52	98.0
22MM2048	0.5	81	3.9	81	5.0	84	-2.4	80	1.2	84	151	81	112	57	-23	76	0.4%	35	-0.4%	30	-0.11	46	99.8
24CC2401	-0.2	71	1.2	71	3.3	75	-2.6	72	2.5	78	153	72	113	51	-65	64	-0.5%	36	-1.2%	31	0.02	44	99.5
24CC2422	0.1	70	3.3	71	7.0	74	-2.8	71	1.4	77	159	71	118	50	-74	63	-2.2%	34	-1.5%	29	0.21	43	100.1

$ Impact of Loin Depth on Dressing %

					Carcass lbs sired vs average		$3.80/lb carcass market value	
	PEMD (mm)	+/- from avg	+/- dressing %*	Dressing %	per lamb	per 225 lambs**	per lamb	per 225 lambs
19RK9081	1.7	0.6	0.19%	52.6%	0.26	58	$0.97	$219
19FG6421	1.9	0.8	0.25%	52.6%	0.34	77	$1.30	$292
22MM2048	1.2	0.1	0.03%	52.4%	0.04	10	$0.16	$36
24CC2401	2.5	1.4	0.44%	52.8%	0.60	134	$2.27	$511
24CC2422	1.4	0.3	0.09%	52.5%	0.13	29	$0.49	$109
Top Shrop	3.3	2.2	0.70%	53.1%	0.94	211	$3.57	$803
Bottom Shrop	-1.6	-2.7	-0.85%	51.5%	-1.15	-259	-$4.38	-$985
Average PEMD	1.1	*1mm change in PEMD = 0.3161% change in dressing percentage						
Average Dress%	52.38%	**Ram breeds 50 ewes w/150% lambs to market for three years = 225 135lb lambs						

$7.95 per carcass spread from top to bottom

$1788 per 225 lambs

Let's play out the added value for the packer…

Ultrasound Loin Muscle Area SD = 2.01 cm^2

2.01 cm^2 = 0.115 LMA $inches^2$

$0.56 in boxed carcass value / 0.115 LMA $inches^2$ = $4.87

What's this mean?

In 2007 - adjusted for carcass weight and backfat - a carcass with a 3.5 in^2 loin area is $8.70 more valuable in the box than a 2.5 in^2 loin area…based on 2007 prices

…what about 2025?

The increase in carcass value per unit of LMA increase is attributed primarily to an increase in dressing percentage, and a much lesser extent to disproportionate increases in high-value subprimal cut weights (i.e., rack, loin, and leg). Boxed carcass value, adjusted for BW and BF, increased US$3.86 and US$6.84 per SD increase in ultrasound and carcass LMA, respectively. These LMA regression coefficient estimates reflect increases in carcass value due jointly to an increase in dressing percentage and to disproportionate increases in high-value subprimal cuts. Adjusting boxed carcass value for chilled carcass weight and BF isolates the effect of disproportionate increases in high-value subprimal cuts. By doing so, boxed carcass value increased only US$0.56 ($P = 0.18$) and US$1.72 ($P < 0.001$; data not shown) per SD increase in ultrasound and carcass LMA, respectively.

2007 prices vs 2025 prices

2007 Boxed Cut Costs in Study

Item	IMPS item No.	Price, US$/45.4 kg
Boxed lamb cuts		
Neck	—	92.55
Square-cut shoulder	207	179.26
Foreshank	210	258.63
Breast	209	81.05
Rack (4 × 4, 8-rib)	204 (medium)	592.09
Loin (3 × 3)	232	558.46[2]
Leg	233A	244.59
Residual carcass[3]	—	51.57[4]
Kidney-pelvic fat	—	0
Offal[5]	—	0
Carcass, gross	—	258.66

62	lb carcass	$/100lb	
	% of carcass	2007	1/3/2025
Neck	2%	$93	$438
Shoulder	23%	$179	$401
Foreshank	3%	$259	$551
Breast	8%	$81	$364
Rack	6%	$592	$1,028
Loin	6%	$558	$703
Leg	16%	$245	$552
	Net Value	$10,034	$20,785
	Increase	207%	
2007 added value:		$4.87	
2025 added value:		$10.09	

What does this all mean?

Selecting for increased muscling benefits producers that direct market or sell on carcass weight due to increased dressing percentage.

The direct marketer and packer have *additional incentive* to select for increased muscle due to improved cutability when breaking that carcass into the box.

	PWWT (kg)	+/- lbs from avg	Live lbs vs avg*	$1.90/lb live market
19RK9081	7.2	2.0	450	$855
19FG6421	0.1	-1.2	-276	-$525
22MM2048	5	1.0	225	$428
24CC2401	3.3	0.2	51	$97
24CC2422	7	1.9	430	$816
Top Shrop	10.4	9.3	2,093	$3,976
Bottom Shrop	-4.7	-5.8	-1,305	-$2,480
Average PWWT	2.8			
Base Weight	135			

*Ram breeds 50 ewes w/150% lambs to market for three years = 225 lambs

	PEMD (mm)	+/- from avg	Dressing %	Carcass lbs vs avg**	$3.80/lb carcass market
19RK9081	1.7	0.6	52.6%	58	$219
19FG6421	1.9	0.8	52.6%	77	$292
22MM2048	1.2	0.1	52.4%	10	$36
24CC2401	2.5	1.4	52.8%	134	$511
24CC2422	1.4	0.3	52.5%	29	$109
Top Shrop	3.3	2.2	53.1%	211	$803
Bottom Shrop	-1.6	-2.7	51.5%	-259	-$985
Average PEMD	1.1	*1mm change in PEMD = 0.3161% change in dressing percentage			
Average Dress%	52.38%	**Ram breeds 50 ewes w/150% lambs to market for three years = 225 135lb lambs			

$1788 spread from top to bottom

Same exercise w/PWWT

$6,456 spread from top to bottom

	Live lbs sired vs average	Dressing %	Carcass lbs sired vs average	$3.80/lb carcass market
19RK9081	450	52.6%	237	$899
19FG6421	-276	52.6%	-145	-$552
22MM2048	225	52.4%	118	$448
24CC2401	51	52.8%	27	$103
24CC2422	430	52.5%	225	$857
Top Shrop	2,093	53.1%	1111	$4,220
Bottom Shrop	-1,305	51.5%	-672	-$2,555

$6,755 spread from top to bottom