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LMY & EQ Producer Demonstration Sites – Victorian sites carcase measurement

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Abstract

Seven Producer Demonstration Sites (PDS) were undertaken in Victoria between 2012 and 2013 to demonstrate the value of research breeding values (RBVs) for lean meat yield, intramuscular fat and shear force in prime lamb and Merino production systems.

Data was collected at slaughter from 1,345 lambs, over 11 slaughter events at JBS; Brooklyn and Cobram, Frewstal; Stawell and Australian Lamb Company; Colac.

Lean meat yield was calculated by measuring hot carcase weight (kg), GRfat (mm), Cfat (mm) and eye muscle area. Objective measures of eating quality were assessed by measuring fresh colour, ultimate pH, shear force and intramuscular fat of the loin. Samples were collected and transported to Murdoch University, Western Australia for intramuscular fat measurement.

Data collected from these PDS will be aggregated with data from other sites and analysed under the national coordination project, B.SCC.0144, to determine the value of RBVs for LMY and eating quality traits to ram breeders, lamb producers and processors.

Executive summary

This project is providing data to the MLA project B.SCC.0144 - Proof of Concept of Lean Meat Yield and Eating Quality Producer Demonstration Sites. The overarching purpose of these projects is to deliver “proof of concept” for lean meat, eating quality and human health attributes within major lamb and sheep meat supply chains by facilitating, empowering and developing a common focus and normal trading mechanisms on these future key industry profit drivers right along the supply chain.

Twenty Producer Demonstration Sites were established to demonstrate the impact new research breeding values (RBVs) for lean meat yield (LMY) and eating quality (EQ), particularly intramuscular fat (IMF) and shear force (SF5), will have on lamb production along the supply chain. Seven producer demonstration sites have been conducted in Victoria. Of the seven Victorian sites, two sites commenced in 2012 and five sites commenced in 2013.

All sites weaned in excess of 200 lambs and the six sites with crossbred lambs (PD01, PD02, PD07, PD08, PD09 and PD10) had over 200 lambs available for selection for carcase measurements. Due to poorer conception rates there were some sires that produced insufficient numbers to obtain 25 lambs per sire. However, the majority of the 43 sires assessed were represented at slaughter by over 20 lambs apart from 2 sires at PD01 (n=14 and 19), 1 sire at PD09 (n=19), 1 sire at PD10 (n=19) and 3 sires at PD20 (n=17, 13 and14). Most sires had 10 or more lambs for eating quality assessment apart from 2 sires with 9 lambs per sire (PD02 and PD09).

Victorian lambs were processed at four processing plants over eleven slaughter dates and went into five supply chains.

Shear force samples were processed at DEPI Werribee within six weeks of the final site slaughter, with SF5 means varying considerably between sites. IMF samples were transported from Werribee to Murdoch University, Western Australia for IMF determination. .

Data collected from these PDS will be analysed in B.SCC.0144 to determine the value of RBVs for LMY and eating quality traits to ram breeders, lamb producers and processors.

Table of Contents

1. Background

The aim of this project is to deliver “proof of concept” for lean meat, eating quality and human health attributes within major lamb and sheep meat supply chains by facilitating, empowering and developing a common focus and normal trading mechanisms on these future key industry profit drivers right along the supply chain. From the Sheep Genomics Program and the Information Nucleus Flock of the Sheep CRC, Poll Dorset, White Suffolk and Merino sires have been identified that have significant differences RBVs for dressing percent, LMY and eating quality, particularly IMF and SF5. Proof of concept Producer Demonstration Sites were established to demonstrate the impact these new RBVs will have on lamb production along the supply chain.

Twenty Producer Demonstration Sites (PDS) were established across Australia involving eight sires per site, with the target of producing 200 lambs for measurement at processing, and allowing 10 lambs per sire to be sampled for eating quality assessment. The PDS are aligned to collaborating supply chains / lamb processors.

This project underpins the delivery of the “Proof of Concept” through high quality sampling and measurement of lamb carcases from LMY and EQ Producer Demonstration Sites. This project encompasses the slaughter, data collection, sample delivery, storage and shear force and intramuscular measurement of the seven sites located in Victoria.

Seven producers hosted demonstration sites over 2 consecutive years commencing in 2012 and 2013. In 2012 two sites (PD01 and PD02) commenced in SW Victoria as Phase 1 pilot PDS aiming to assess the methodology and concept of producer demonstration sites for LMY & EQ. Successful completion of these two PDS lead to Phase 2 and in 2013 a further 5 sites were established in Victoria, with two sites located in SW Victoria and three sites in NE Victoria (PD07, PD08, PD09, PD10 and PD20), along with an additional 13 sites established in SA, Tasmania, Western Australia and NSW.

Data from sites as well as individual sires used in this project will be aggregated for analysis, validation of the RBVs and used in major communications programs with Sheep Genetics, MLA and the Sheep CRC. The data will contribute to the overall outcomes of the LMY & EQ Proof of Concept project (B.SCC.0144), which include:

1. Determining the value of new research breeding values for ram breeders, lamb producers & processors at 20-30 sites.
2. Developing suitable measurement technology and feedback mechanism for these breeding values at processing.
3. Initiating a common focus and foster the development of normal trading mechanisms including potential Value Based Trading on these future key industry profit drivers right along the supply chain.

2. Project objectives

By 31 August 2014:

1. Coordinated slaughter and abattoir data and sample collection.
2. Collected carcase measurements on up to 200 lambs per site.
3. Collected, processed and stored lamb loin samples for IMF and Shear Force (5 days aged) measurement on up to ten progeny per sire per site (up to 80 lambs per site).
4. Shipped samples for IMF testing to Murdoch University, WA, within three weeks of the final slaughter at each site
5. Conducted measurement of Shear Force at day 5 within six weeks of the final slaughter group from each site.
6. Submitted all data in the standard data template to the LM&EQ PDS National Coordinator within six weeks of the final slaughter group from each site.

3. Methodology

Twenty Producer Demonstration Sites (PDS) were established across Australia to demonstrate the impact new research breeding values (RBVs) for lean meat yield (LMY) and eating quality, particularly intramuscular fat (IMF) and shear force (SF5), will have on lamb production along the supply chain.

At each site ewes were artificially inseminated to 8 sires that were selected for divergent RBVs for LMY, IMF and SF5 (2 high and 2 low by 2 traits). Depending on the ewe breed, ewes were inseminated with semen from terminal sires (Poll Dorset or White Suffolk) or Merino rams (Table 1) with extreme RBVs for LMY, IMF and SF5. There were a total of 43 sires assessed in 2012 and 2013. In 2012 the same 8 sires were used at both PD01 and PD02 sites and 2 of these sires were assessed at 2 sites in 2013. In 2013 sires varied at each site, however there were 3 sites that assessed the same 2 sires (making a total of 3 individual sires assessed at these 6 sites) thereby providing linkages between sites using the same sire breeds. At PD01 and PD02 two rams per site from different studs belonging to the PD producers were used to naturally mate 200 ewes. These ewes were used as a comparison to the project AI ewes and their lambs measured for lean meat yield (LMY) and eating quality (EQ) traits.

Lambs were selected for processing aiming for 25 lambs per sire to provide a total 200 lambs. Lambs were selected so that sires were represented by both single and multiple births, when known, and male and female where both sexes were available (PD07, PD08, PD09, PD10) and a range of liveweights. Of the 25 lambs, samples for eating quality were obtained from 10 lambs and all lambs were measured for lean meat yield.

Lambs were processed at liveweights that met with the standard marketing specifications for each producer's lamb enterprise. Where possible processors were selected according to where the producer normally processed their lambs providing electrical stimulation was available at the abattoir. At all sites lambs were taken off feed on the morning of transporting and curfewed off feed and water for 6-8 hours depending on the site.

1. Coordinated slaughter and abattoir data and sample collection

Measurements from the demonstration sites were collected over eleven slaughter dates (Table 1) for progeny born in 2012 (PD01 and PD02) or 2013 (PD07, PD08, PD09, PD10 and PD20). Progeny born in 2012 were processed in 2013 with PD01 processing over 2 kills and PD02 over 4 kills. Table 1 shows the number of lambs processed for lean meat yield and number of lambs sampled for eating quality at each kill. For the 2013 sites, two sites processed their lambs on the same day (PD09 and PD10) and three 2013 sites (PD07, PD08, PD20) processed their lambs over 2 kills, some weeks apart.

Carcase and eating quality measurements were undertaken in accordance with those developed by the Sheep CRC (Pearce 2009).

Table 1. Sire and ewe breed and processor details, slaughter dates and number of lambs processed at each draft at individual sites

Site	Sire Breed	Ewe Breed	Date of slaughter	Processor / Supply Chain	No. Lambs	LMY & EQ	LMY only
PD01	Terminal	Maternal composite	K1 30/1/13	JBS Brooklyn	132	62	111
			K2 9/4/13		56	29	
			Total		**188**	**81**	
PD02	Terminal	Maternal Composite	K1 30/1/13	Coles at JBS Brooklyn	62	32	105
			K2 14/2/13		83	32	
			K3 5/3/13		40	17	
			K4 9/4/13		14	—	
			Total		**199**	**81**	
PD07	Terminal	Maternal composite	K1 30/10/13	JBS Cobram	121	80	41
			K2 28/11/13		71		71
			Total		**191**		
PD08	Terminal	Maternal composite	K1 28/11/13	JBS Cobram	101	80	21
			K2 10/4/14		98		98
			Total		**199**		
PD09	Terminal	Coopworth	K1 19/12/13	ALC Colac	**208**	80	128 (incl. 8 own)
PD10	Terminal	Maternal composite	K1 17/12/13	Frewstal, Stawell	**193**	80	113
PD20	Merino	Merino	K1 28/8/14	JBS Brooklyn	111	98	13
			K2 8/10/14		57		57
			Total	JBS Cobram	**167**		

Hot carcase weight (HCWT), GR tissue depth, CFAT thickness, and eye muscle depth (EMD) and width (EMD) at the 12th rib were measured to calculate LMY.

HCWT and works fat score and/or works GR tissue depth was provided by the processing plant. GR fat (mm) was measured with a GR knife 4-6h post-mortem at the 12th rib, 110mm from the spinal column on the right-hand side of the carcass. As an estimate of ultimate pH at approximately 20h post-mortem, pH levels were recorded in the left *m. longissimus thoracic et lumborum* (LL) at the 13th rib for both years and in 2013 the *m. semitendinosus* (ST) was also measured.

Carcases were cut between the 12th and 13th ribs approximately 20 hours after slaughter to expose a cross-section of LL (Figure 2). Eye muscle width (EMW, mm), eye muscle depth (EMD, mm) and CFAT (mm) were measured with digital callipers (Sontax 0-150 mm) on the exposed surface of the LL. EMA was calculated from EMW and EMD according to the equation:

$$EMA\ (cm^2) = EMW\ (mm^2) * EMD\ (mm^2) * 0.008.$$

Fresh eye muscle colour was measured approximately 21 hours post-mortem on the exposed section of LL that was allowed to 'bloom' for 30-60 minutes. A Minolta Chromameter CR-400 was used to measure lightness (*L**), redness (*a**) and yellowness (*b**).

Full liveweight (kg) was collected immediately off feed for PD07, PD08 and PD20 and pre-slaughter weights were collected on-farm after 6-7h curfew time prior to transport to the abattoir at PD07, PD08, PD09, PD10 and PD20. Pre-slaughter weights were compared to HCWT (kg) at slaughter to calculate dressing percent (DP) for PD07, PD08, PD09, PD10 and PD20. Full or curfew liveweight prior to slaughter was not obtained from PD01 and PD02.

Figure 1. Wayne Brown, DEPI splitting carcases between the 12th and 13th ribs (left).

Figure 2. PD07 carcases split between the 12th and 13th ribs to allow colour and eye muscle area measurements on the exposed surface of the LL and demonstrating variation in fatness and eye muscle between sires (right).

2. *Collected, processed and stored lamb loin samples for IMF and Shear Force (5 days aged) measurement on up to ten progeny per sire per site (up to 80 lambs per site).*

At approximately 21h post-mortem, 13cm of the left section of the LL was removed from above the 12th rib. From this section of LL, the fat and epimysim were removed and SF5 (65g) and IMF (40g) samples were collected. IMF samples were frozen immediately after collection, and stored at -20°C. The weight of the IMF tube with lid off was taken and the weight of the frozen IMF tube and sample was also taken and recorded.

The SF5 samples were vacuum packed and aged at 4-5ºC for five days prior to freezing at -20ºC.

Frozen SF5 samples were placed into a water bath at 71°C for 35min to cook, and then immersed in chilled water prior to processing. The samples were processed according to the methods of Hopkins and Thompson (2001) and a Lloyd LRX machine was used to measure 5-6 1cm^3 sub-samples from each 65g LL sample. Shear force results are presented using the SI unit of force - Newtons (N) - rather than the non SI unit - kgF.

4. Results and discussion

3. *Collected carcase measurements on up to 200 lambs per site.*

All sites weaned in excess of 200 lambs and the eight sites with crossbred lambs (PD01, PD02, PD07, PD08, PD09 and PD10) had over 200 lambs available for selection for carcase measurements. Due to poorer conception rates there were some sires that produced insufficient numbers to obtain 25 lambs per sire. However, the majority of sires were represented at slaughter by over 20 lambs apart from 2

sires a PD01 (n=14 and 19), 1 sire at PD09 (n=19), 1 sire at PD10 (n=19) and 3 sires at PD20(n=17, 13 and14) as shown in Table 2. Most sires had 10 or more lambs for eating quality determination apart from 2 sires with 9 lambs per sire (PD02 and PD09).

Collection of carcase measurements at the processing plants went smoothly with only a few issues. For PD20, two carcases at JBS Brooklyn and one carcase at JBS Cobram were lost down the chute when the skin was pulled and therefore measurements were not obtained for these 3 lambs. At JBS Brooklyn we were not made aware of the two missing carcases until all lambs had been processed and conveyed into the chiller. Since we could not determine where in the sequence the lambs went missing the identification of the lambs was determined based on the dressing percentage calculated from the curfew weight and carcase weight. Although we are reasonably confident lambs have been identified correctly meat samples were collected from all lambs in the chiller and of these 12 were selected and sent to obtain sire parentage to confirm lamb identification. Additionally, 8 lambs lost tags at shearing and meat samples were also sent to confirm sire parentage. Parentage results are not yet available at the time of writing this report and the 8 lambs are currently identified in Table 2 as unknown.

There were a few lambs at all sites which were heavily trimmed. This was recorded on the kill floor and carcase weight removed from dressing percentage calculations and, depending on the trim, some measurements such as fat and eye muscle were not obtained.

The first draft of PD20 lambs (n=111) were processed at JBS, Brooklyn on August 28th, 2014. These lambs were processed in Brooklyn as 98 (12 lambs per sire) of the 111 lambs were used in collaboration with CSIRO for a meat packaging experimental project (A.MQT.0068) as the sire parentage and Research Breeding Values of the lambs was available which will be utilised when interpreting experimental results.

Producers from all sites were invited to view their lambs and assist with data collection, and producers from PD01, PD02 PD07, PD08, PD09 and PD10 attended at least one draft of lambs when processed.

Figure 3. Gervaise Gaunt, DEPI, producers Graham and Polly Sudholz and Nick Linden DEPI at JBS Cobram, October 2013.

Table 2. Number of progeny slaughtered from each ram at each site, and number of lambs allocated to Lean Meat Yield (LMY) or Lean Meat Yield and Eating Quality (LMYEQ) per sire.

Sire	***PD01***		***PD02***		***PD07***		***PD08***		***PD09***		***PD10***		***PD20***	
	LMY	LMYEQ	LMY	LMYEQ	LMY	LMYEQ	LMY	LMYEQ	LMY	LMYEQ	LMY	LMYEQ	LMY	LMYEQ
Sire 1	10	10	10	10	15	10	15	10	21	10	15	10	11	12
Sire 2	10	10	11	10	15	10	12	10	15	10	10	10	5	12
Sire 3	11	10	12	10	15	10	15	10	21	10	15	10	2	11
Sire 4	9	10	10	11	13	10	16	10		9	15	10	7	14
Sire 5	15	10	11	9	14	10	15	10	15	10	13	10	12	12
Sire 6	9	11	10	10	10	10	14	10	13	12	7	10	13	13
Sire 7	4	10	12	10	15	10	16	10	19	10	23	10	3	11
Sire 8	13	12	17	10	15	10	17	9	15	10	15	10	9	13
Sire 9	15	5	18	1										
Sire 10	9	12												
UK*													8	
Total	**105**	**91**	**111**	**81**	**112**	**80**	**120**	**79**	**127**	**81**	**113**	**80**	**70**	**98**

*Currently unknown and sire parentage to be determined from DNA

Since producers processed their lambs according to their own standard marketing liveweight specifications, there is a range both between and within PDS in the carcase measurements (Table 3).

Table 3. Simple statistics for HCWT, WKSFAT score, GR depth, CFAT, EMD, EMW, EMA and dressing percent (DP) for each site.

Variable	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
	PD01*					PD02*				
HCWT (kg)	195	20.9	1.92	14.9	25.8	191	22.0	1.67	16.3	26.0
WKSFAT (1-5)	195	2.6	0.62	2	4	191	3.5	0.54	2	4
HGRFAT (mm)	195	7.0	3.96	1.0	21.0	190	10.4	3.41	4.0	21.0
CCFAT (mm)	195	2.5	1.18	1.0	7.0	190	3.7	1.92	1.0	20.0
CEMW (mm)	195	62.9	3.85	50.0	73.0	190	63.0	3.52	53.0	74.0
CEMD (mm)	195	26.9	3.08	19.0	35.0	190	31.0	3.17	21.0	43.0
CEMA (mm^2)	195	13.6	2.07	8.0	19.3	190	15.7	2.1	10.8	25.5
	PD07					PD08				
HCWT (kg)	192	25.5	2.08	19.0	32.4	199	21.7	2.78	15.6	31.6
WKSFAT (1-5)	192	2.8	0.63	2	5	199	2.7	0.76	1	5
HGRFAT (mm)	192	15.7	3.92	1.0	25.0	199	9.4	3..55	3.0	23.0
CCFAT (mm)	192	4.4	1.94	1.0	11.0	198	3.7	2.08	0.5	11.0
CEMW (mm)	192	67.2	3.72	56.3	78.7	198	63.8	3.87	54.0	74.5
CEMD (mm)	192	33.1	3.04	23.0	40.3	198	31.0	3.94	20.0	43.0
CEMA (mm^2)	192	17.8	3.72	13.1	22.8	198	15.9	2.56	10.2	24.7
DP (%)	192	50.8	3.2	40.0	62.9	194	49.0	2.0	41	54
	PD09					PD10				
HCWT (kg)	208	21.3	2.84	14.9	28.8	193	19.7	1.85	15.1	24.7
WKSFAT (1-5)	208	2.6	0.68	2	4	189	2.9	0.49	2	4
HGRFAT (mm)	208	12.6	3.80	5.0	25.0	193	7.5	2.91	3.0	17.0
CCFAT (mm)	208	4.1	1.88	1.0	11.0	190	2.4	1.04	1.0	5.0
CEMW (mm)	208	62.8	3.50	52.0	73.0	190	64.7	3.64	55.3	76.0
CEMD (mm)	208	28.7	3.00	19.0	38.0	190	27.6	2.88	20.0	35.0
CEMA (mm^2)	208	14.5	1.85	8.5	19.0	190	14.3	1.89	9.6	19.0
DP (%)	208	46.1	2.0	39.1	53.9	193	44.0	2.0	38	53

Table 3 continued. Simple statistics for HCWT, WKSFAT score, GR depth, CFAT, EMD, EMW, EMA and dressing percent (DP) for each site.

Variable	N	Mean	SD	Min	Max
	PD20				
HCWT (kg)	168	18.5	2.08	13.9	25.8
WKSFAT (1-5)	168	2	0.48	1	3
HGRFAT (mm)	167	4.7	2.22	1.0	12.0
CCFAT (mm)	166	4.6	1.01	0.1	6.0
CEMW (mm)	166	57.9	4.04	44.0	68.0
CEMD (mm)	166	24.8	3.03	18.0	33.3
CEMA (mm^2)	166	11.5	1.68	7.7	16.9
DP (%)	168	40.7	2.7	33.8	48.8

*Liveweights were not obtained from PD01 or PD02 prior to transport and therefore dressing percentage was not calculated for these sites.

Fresh colour measurements of the loin were within normal range across all sites (Table 4). Ultimate pH (pHu) was measured only on the lambs allocated to eating quality for 2012 sites (PD01 and PD02) and on all carcases for 2013 lambs (PD07, PD08, PD09, PD10) as shown in Table 4.

For site PD20, CSIRO measured pH on either LL or SM (*m. semi-membranous*) muscle samples taken on the same day other carcase measurements were taken (1 day post-slaughter) and transferred to the laboratory where CSIRO processed samples for their project. This resulted in 98 samples measured for LL pHu rather than all 111 lambs processed that day.

All pHu measurements of the LL from PD02, PD07, PD09, PD10 and PD20 were acceptable with only 0-3 % carcases below pH6.0. PD08 and PD01 showed higher pH's than other sites with 16% and 33 % above pH6.0 respectively.

Average pHu of the ST muscle of PD08 carcases was also high, but similar to levels seen in the INF. The pHu of the LL and the ST of the Merino lambs (PD20) was within a similar range of the terminal sired lambs. Average pH of the ST muscle was higher than the loin at all sites as would be expected. The pHu of the ST was not measured for 2012 sites.

Table 4. Simple statistics for loin colour (lightness, *L**; redness, *a**; brightness, *b**), ultimate pH of the LL and ST for each site

	PD01					PD02				
Variable	**N**	**Mean**	**SD**	**Min**	**Max**	**N**	**Mean**	**SD**	**Min**	**Max**
Lightness (L*)	91	33.6	2.52	28.65	38.93	81	35.8	1.91	31.8	41.2
Redness (a*)	91	17.0	1.22	14.02	20.28	81	17.0	1.32	13.3	20.0
Brightness (b*)	91	8.1	1.22	5.15	11.62	81	8.7	10.4	5.9	10.9
pHLL	93	5.90	0.29	5.43	6.61	81	5.60	0.07	5.48	5.78
	PD07					**PD08**				
Lightness (L*)	192	34.6	1.4	30.3	41.0	199	35.2	1.5	30.4	40.3
Redness (a*)	192	18.8	1.11	14.6	22.0	199	17.7	1.37	13.1	20.9
Brightness (b*)	192	9.6	0.87	6.3	11.5	199	8.8	0.97	6.0	11.7
pHLL	192	5.63	0.11	5.43	6.32	199	5.81	0.19	5.49	6.62
pHST	192	5.79	0.23	5.37	6.82	199	6.00	0.35	5.14	6.93
	PD09					**PD10**				
Lightness (L*)	208	35.6	1.47	31.8	38.5	190	33.4	1.67	29.0	37.2
Redness (a*)	208	18.1	1.12	15.7	21.0	190	16.6	1.12	13.2	20.2
Brightness (b*)	208	9.5	0.90	6.9	11.9	190	8.5	10.6	6.1	11.0
pHLL	207	5.71	0.03	5.62	5.83	190	5.75	0.09	5.08	6.12
pHST	207	5.75	0.20	5.44	6.50	192	5.84	0.19	5.53	6.56
	PD20									
Lightness (L*)	167	34.4	1.78	29.0	41.4					
Redness (a*)	167	16.7	1.39	11.2	20.0					
Brightness (b*)	167	8.0	0.96	5.0	10.3					
pHLL or SM[#]	141	5.71	0.16	5.40	6.22					
pHST	168	5.86	0.28	5.55	6.93					

[#] LL or SM

4. *Conducted measurement of Shear Force at day 5 within six weeks of the final slaughter group from each site.*

Eating quality samples (10/sire) were obtained from progeny born in 2012 (PD01 and PD02) which were collected over multiple kills (Table 1). All eating quality samples were collected at 2013 sites on the same day. For 2013 sites where lambs were processed over two kills, all samples were obtained at the first kill which also meant some lambs were required to be processed at a lower carcase weight to obtain the number required per sire.

Shear force measurements were completed within six weeks of the final slaughter group for 2013 sites and within eight weeks for 2012 sites as shown in Table 5.

Merino PD20 and crossbred lambs from PD08 had the lowest mean shear force at 23.9N with 94% and 97% lambs falling under 40N respectively (Table 6). PD07 (25.0N), PD09 (26.7N) and PD01 (28.98N) achieved 95%, 93% and 90% lambs <40N respectively. PD02 lambs averaged higher at 32.4N with 81% <40N.

In contrast, only 21% of PD10 lambs measured <40N even though the lambs were electrically stimulated. Further investigation is required at both the farm and processor level to determine possible causes of lambs from this site having tougher loins than the other sites.

Table 5. Date of measurement and simple statistics shear force (N) for each site

Site	***Measurement date***	***N***	***Mean***	***SD***	***Min***	***Max***
PD01	6-8/6/2013	91	28.8	7.87	15.6	50.4
PD02	5-8/6/2013	81	32.4	8.86	19.1	56.9
PD07	6/11/2013	80	25.0	5.89	14.2	43.0
PD08	30/1/2014	79	23.9	7.89	14.2	61.9
PD09	3,10/2/2014 7,9,13/1/2014	78	26.7	7.76	14.9	58.5
PD10	21,23,28/1/2014	81	46.5	8.76	30.4	68.0
PD20	9-10/9/2014	98	23.9	5.25	19.5	43.6

Figure 4. Removing loin samples at JBS Brooklyn, Melbourne.

5. *Shipped samples for IMF testing to Murdoch University, Perth, WA, within three weeks of the final slaughter at each site*

IMF samples were frozen and stored at DEPI Werribee after each kill. As agreed with the National Coordinator for ease of logistics and to reduce cost, samples were transported to Murdoch University, Perth, WA, for analysis in one batch for 2012 sites and two batches for 2013 sites with samples for PD01, PD02, PD07, PD08, PD09 and PD10 sent in one batch on 21st July, 2014 and PD20 sent immediately after the kill on 2nd September, 2014.

IMF results are shown in Table 6 with 3 sites PD09, PD10 and Merino lambs at PD20 having a mean of 4% or greater for IMF. Four percent is the minimum IMF required to achieve an acceptable level of consumer satisfaction in Australia (Hopkins *et al;* 2006*).* Sires in this project were selected for divergent lean meat yield and lower IMF is usually expected as a consequence of selecting for high LMY sires. Further data detailing individual sire influence on progeny IMF will be reported in B.SCC.0144.

Table 6. Simple statistics for intramuscular fat percentage (IMF) for each site

Site	***N***	***Mean***	***SD***	***Min***	***Max***
PD01	92	3.4	0.85	1.8	5.6
PD02	84	3.3	0.90	1.4	6.4
PD07	80	3.4	0.51	2.3	5.0
PD08	77	3.9	0.95	2.2	6.3
PD09	78	4.8	0.87	2.7	7.6
PD10	81	4.0	0.85	2.8	6.3
PD20	98	4.4	0.88	2.7	7.6

6. *Submitted all data in the standard data template to the LM&EQ PDS National Coordinator within six weeks of the final slaughter group from each site.*

All data has been collected and submitted to the National Coordinator for analysis in B.SCC.0144 which will include discussion on individual sire performance for LMY and EQ.

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