final report

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Proof of concept of lean meat yield and eating quality producer demonstration sites – Bombala, NSW

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Abstract

Lamb consumers are constantly demanding juicy, tender lamb which is full of flavour. Processors are paying producers to produce a quality lamb carcass with high targets for lean meat yield (LMY) and dressing percentages. To optimise profitability in their meat sheep enterprise, producers need to be able to accurately select terminal sires that will produce progeny which perform in these desirable traits ie. high lean meat yield carcasses, which still meet acceptable measurements for shear force (less than 40N shear force) and intramuscular fat (4-6%).

This project is trialling, on-farm, the efficacy of research breeding values (RBVs) for lean meat yield (LMY) and eating quality. It aims to demonstrate that the RBVs for LMY, shear force (SF5) & intramuscular fat (IMF) can be translated through the lamb supply chain thereby enabling greater selection of sires based on these RBVs for these desirable traits. It also aims to validate research breeding values for LMY and EQ traits on-farm, in multiple different environments and through multiple supply chains.

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 yeild, 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, particularly intramuscular fat (IMF) and shear force (SF5), will have on lamb production along the supply chain.

South east New South Wales sheep and cattle producer Brad Yelds, "Cobana Pastoral" agreed to participate in the project and host a "proof-of-concept" site on his property Cobana, at Bombala.

Three hundred and nine-teen (319), 1st cross ewes participated in the program and were randomly allocated to 8 terminal sires. The eight (8) terminal sire rams used at the Cobana site had high LAMBPLAN index's for the breed as well as favourable ASBVs for common traits such as weaning weight (WWT) & post weaning weight (PWT), . The difference between the rams was in the RBVs for LMY and eating quality. The eight (8) rams selected had either high or low RBVs for lean meat yield (LMY), shear force (SF5), intramuscular fat (IMF), hot carcass weight (HCWT) and/or dressing percentage (DP %).

A livestock schedule detailing AI and lambing timelines and ewe management was established and an approximate slaughter date identified. The ewes were managed to LTEM guidelines.

All ewes were electronically tagged, weighed and condition scored (18th March 2013) as well as prepared for AI. 319 ewes were AI'd over a two day period (20th and 21st of March) by Livestock Breeding Services (Michelle Humphries, BVSc). All details were electronically recorded using a Gallagher TSI database software system.

The ewes (317) were pregnancy scanned on the 18th and 19th of June 2013 with a total count of 307 potential lambs. Conception rates for the 8 sire groups ranged between 49% up to 72% with a high rate of twins in the majority of groups.

The ewes commenced lambing around the 20th of August 2013 and marking and blood typing of the lambs was conducted on the 20th of September, 2013, to determine sire parentage.

Lambing percentage was 89.5% survival with 275 lambs weaned in November 2013 (average 35.1 kg). A second weight on the 9th of December gave a group average of 40.6 kg. The lambs were slaughtered in two groups; 55 lambs were slaughtered on the 16th of December, 2013, (average weight of 49.5 kg) and 166 lambs were slaughtered on the 30th of January, 2014, (average weight 45.2kg). All lambs were slaughtered at Cootamundra abattoir.

The survival and weaning rates of the progeny were very good and therefore this site was able to deliver the required number of lambs to the abattoir for the carcass measurement and analysis. All ewes and lambs were managed throughout the trial to LTEM guidelines.

The results from this site will go into the nationwide data pool to be analysed alongside results from the nineteen other lean meat yield and eating quality “proof-of-concept” sites under MLA project B.SCC.0144.

An overview of the nationwide project as well as the local results was presented by the National Coodinator, Janelle Hocking-Edwards, to approx. 55 producers in Nimmitabel on Tues July 22nd. The project was also regularly updated to Monaro Farming Systems members through newsletters.

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AI procedure at Cobana Shearing Shed, March 2013, Livestock Breeding Services (Michelle Humphries, BVSc)

1. Background

Lamb consumer expectations have increased in alignment with increasing lamb prices to purchase “value-for-money” lamb that is juicy, full of flavour and tender. Juiciness is strongly correlated with intramuscular fat (IMF) and tenderness is correlated with an objective measurement of shear force (SF5). However, higher the lean meat yield (LMY) is favoured by processors due to efficiency and economic gains during processing. Therefore, in terms of profitability drivers, producers have an incentive to grow lambs with more muscle and less fat.

However, genetic correlations between traits often work against each other, for example, when selecting sires for both eating quality (IMF) and LMY. There is a strong genetic correlation between IMF and tenderness and also a strong correlation between high LMY and low IMF. There is also a moderate correlation between increasing LMY and decreasing tenderness.

The challenge for producers is to increase LMY without sacrificing tenderness and flavour which is the main motivation behind the implementation of these “proof of concept” producer demonstration sites to validate research breeding values (RBVs) for LMY and eating quality traits.

2. Project objectives

This project produced lambs to contribute to validating research breeding values for LMY and EQ traits on-farm, in multiple different environments and through multiple supply chains. Overall, the project involves sixteen (16) sites nationwide (including this site at Bombala, NSW) comparing progeny of ninety (90) terminal breed rams; and four (4) sites comparing the progeny of thirty (30) merino rams.

Twelve (12) processing plants were involved and seven (7) supply chains.

The project aims to deliver “Proof of concept” for lean meat, eating quality and human health attributes within major 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. This will be achieved by:

1. Determining the value of 3 or more 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 fostering the development of normal trading mechanisms on these future key industry profit drivers right along the supply chain.

Site facilitator objectives

- To professionally and efficiently co-ordinate and oversight Producer Demonstration Sites to ensure the approved key activities are achieved, activities are aligned and integrated and all measurement, monitoring and evaluation is carried out according to the project plan.
- To ensure that rigorous timely measurement occurs on all animals and that they reach target slaughter specifications.
- To ensure the ewes are run in accordance with Lifetime Ewe Management (LTEM) targets.
- To ensure 20-50 producers are actively engaged per site.
- To coordinate at least one field day / workshop per site.

3. Methodology

A producer in south east NSW, Brad Yelds of “Cobana Pastoral”, agreed to host a producer demonstration site. He managed the ewes to LTEM targets at mating and through pregnancy. Ewes were condition scored prior AI and light ewes were removed from the flock. A representative sample of ewes was condition scored at scanning and marking to monitor ewe condition.

The host producer prepared the ewes for a two day artificial insemination (AI) program which was conducted on the 20th and 21st of March 2013. Sponges were inserted and ewes condition scored on the 10th and 11th of March 2013. All ewes were electronically tagged.

Commercial AI operators were engaged to undertake the process (Michelle Humphries, BVSc, Livestock Breeding Services). 320 composite ewes were inseminated with semen from eight terminal sires (Poll Dorset and White Suffolk). Brad gained approval to use semen from one of his own sires (090909). Rams were selected for divergent RBVs for LMY, IMF and SF5. Sheep Genetics sourced all of the semen and arranged delivery to the AI operators. Sires were given equal opportunity with ewes randomised for weight and CS.

Pregnancy scanning was undertaken by a commercial scanning operator on the 18th and 19th of June to identify ewes carrying single, twins or triplets to AI rams.

Lambs were tagged with electronic tags and visual identification tags at marking when they were also blood typed for parentage testing.

A small blood sample was collected from the ear of each lamb at marking and sent to a commercial provider for parentage testing (sire only). Lambs were weighed at regular intervals from marking until slaughter. A final live weight was recorded, prior to loading onto trucks for slaughter.

Animal use in the project was approved by the Agrisearch Services Pty Ltd Animal Care and Ethics Committee (ACEC number 1308).

All project data recorded by a TSI software management system.

A work program with approximate timelines for each task is outlined in Table 1.

Table 1: Events (AI, pregnancy scanning, lambing, marking and weaning to slaughter) and approximate dates for completion for each event for the Yelds Producer Demonstration Site.

Date	***Activity***
10th/11th March 2013	Insert sponges & ewe condition score
20th/21st March 2013	AI & record sire/ewe mating's
18th/19th June 2013	Pregnancy scan
20th Aug 2013	Lambing
20th Sept 2013	Marking & lamb blood sampling
14th Nov 2013	Weaning date
14th Nov 2013	Live weight (WT1)
9th Dec 2014	Live weight (WT2)
16th Dec 2013	1st draft (55 lambs) to Cootamundra abattoir. Pre-slaughter weight (PSWT1)
12th Jan 2014	Live weight (WT3)
24th Jan 2014	Live weight (WT4)
30th January 2014	2nd draft (166 lambs) to Cootamundra abattoir. Pre-slaughter weight (PSWT2)
22nd July 2014	Field Day held at Nimmitabel

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4. Results

The following two tables (2 & 3) describe the conception rates and live date collected throughout the trial prior to slaughter. Conception rates ranged from 49% to 72% across the 8 groups of ewes with a high percentage of twins. The potential lambs out of 317 ewes were 307. Overall there was a conception / pregnancy rate of 60.25 % and approximately 40% of the ewes were dry.

At scanning 38% of the pregnant ewes were carrying singles and 62% of the pregnant ewes were carrying twins.

Due to the favourable seasonal conditions and good quality nutrition afforded to the ewes, survival rate of the lambs was 89.5%. The ewes were run as a single mob, on an improved pasture consisting of phalaris, lucerne, some legume and other annual grasses with an average biomass of 2,500 kgDMha.

Table 2. Scanning results (N= number of ewes scanned; 1 = number of ewes carrying single foetuses, 2 = number of ewes carrying twins) and Av CS = average ewe condition score at scanning

	N	***1***	***2***	***Dry***	***% Wet***	***Potential Lambs***	***Conception rate***	***Av CS***
Ram 1	40	8	13	19	53	34	85%	3.15
Ram 2	40	8	17	15	63	42	105%	3.08
Ram 3	39	7	19	13	67	45	115%	3.05
Ram 4	40	6	16	18	55	38	95%	3.05
Ram 5	40	13	12	15	63	37	93%	3.1
Ram 6	39	10	9	20	49	28	72%	3.13
Ram 7	40	13	11	16	60	35	88%	3.03
Ram 8	39	8	20	11	72	48	123%	3.08
Overall	317	73	117	127	60%	307	97%	3.08

Photo: Ewes and lambs following marking / blood collection for DNA sire identification

Table 3. Live results

Activity	Timing	Result
AI	March 2013	317 ewes CS = 3.1
Scanning	June 2013	60% pregnant (190 ewes) 38% single 62% multiple
Lambing	August 2013	89.5% survival
Weaning	Nov 2013	275 lambs weaned 35.1kg average 16.6 - 46.2 kg range
Weight	9 Dec 2013	40.6kg average 23.6 – 52.5kg range
Slaughter	16 Dec 2013 (55 lambs)	49.5 kg average
Slaughter	30 Jan 2014 (166 lambs)	45.2 kg average

A total of 275 lambs were weaned In November 2013 at an average weight of 35.1 kg with a range of 16.6 – 46.2 kg. A second weight on the 9th Dec. 2013 gave an average weight of 40.6 kg with a range of 23.6 – 52.5 kg. On the 16th December a total of 55 lambs were drafted off for slaughter having reached an average weight of 49.5 kg. This draft of lambs was slaughtered at Cootamundra abattoirs. A second and final draft of 166 lambs was slaughtered at Cootamundra abattoirs on the 30th of January at an average weight of 45.2 kg.

Table 4 shows the growth rates in grams per head per day for the progeny of the eight sires. There is some variation in progeny growth rates between sires. Growth rates range from 194 to 241 g / hd / day in the 1st measurement period, 52 to 111 s / hd / day in the 2nd measurement period and 367 to 496 g / hd / day in the last measurement period.

Table 4. Average progeny weights (kg) and growth rates (g/day)

Sire	*Wt1*	*Growth*	*Wt2*	*Growth*	*Wt3*	*Growth*	*Wt4*	*PSWT2*
Ram 1	33.3	207	38.5	88	41.5	496	47.5	44.8
Ram 2	32.7	238	38.7	92	41.8	469	47.4	44.7
Ram 3	33.4	241	39.5	93	42.6	461	48.1	45.9
Ram 4	34.6	194	39.5	77	42.1	367	46.5	44.2
Ram 5	33.0	223	38.6	111	42.4	466	48.0	45.0
Ram 6	34.7	217	40.2	85	43.1	458	48.6	45.6
Ram 7	35.7	223	41.3	52	43.1	426	48.2	45.5
Ram 8	34.2	212	39.5	111	43.2	459	48.8	45.8

Note: The first draft of heaviest lambs (55) was taken off for slaughter on the 16th Dec 2013 & remainder (166) were slaughtered on the 30th of January.

One field day was held which formally showcased the LMY & EQ PDS project and gave preliminary results for the Yelds site. Information about the project was presented at the Monaro Farming Sysytems / Rabo Bank Field Day in Nimmitabel on the 22nd of July 2014. This day was attended by approximately 60 participants made up of 50 producers, and 10 organisational staff from MFS and Rabo.

Photo: Weaned lambs yarded for weighing, 9th Dec 2013

5. Discussion/conclusion

Due to the fact that the nationwide data set is not yet complete, no definitive conclusions can yet be made. It is hoped that complete analysis will demonstrate that the significant differences between sires in RBVs can be translated through to their progeny in carcass and eating quality traits.

It remains important for the Industry that when selecting rams, producers should consider the RBVs for eating quality traits to make informed decisions and try to avoid rams which have undesirable RBVs for these traits.
However producers should still keep a focus on those ASBVs that are important profit drivers for their individual systems.

This project has helped to improve the relationship and communication between all players in the supply chain including producers, processors, retailers and consumers. The project has helped to focus attention on the relationship between producers and processors and highlights the importance of processors using a grid system to reward producers for delivering a quality product where they are paid on reaching carcass performance targets.

One of the limitations in the supply chain is the lack of accurate measurement technology in processing plants which limits the amount of carcass measurement.
More research is needed into technology which will enable processors to measure IMF and LMY, develop feedback systems and develop payment systems more aligned to carcase value.

Photo: Pregnancy scanning at Cobana shearing shed

6. Appendix 1: Photos

AI – Livestock Breeding Services (Michelle Humphries, BVSc)

Pregnancy scanning – Brad Yelds

Lamb marking/blood typing

Slaughter weighing

Field day – 22nd July 2014 - Nimmitabel