

“Optimising Red Meat Productivity Project”

A Meat & Livestock Australia Producer Initiated Research & development (PIRD)
Project run by the South East Prime Livestock Achievers (SEPLA) Group

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Aim

“To increase the kilograms of red meat produced per hectare, in an economically and environmentally sustainable manner”.

During the study period, seven businesses ran trials on their properties. These businesses aimed to increase their current level of red meat production per hectare by 30 to 50%, through a range of methods including meeting the nutrient requirements of lambs through targeted supplementation, changing finishing systems, grazing management, alternative pasture varieties, and fertiliser management.

On each property their ‘new system’ was designed to increase their current levels of red meat production, and most were compared against production from their pre-existing systems.

Project Objectives

- To increase the current amount of kg of red meat produced per hectare by 30 to 50%, based on current individual benchmarking figures or derived using the cost of production calculator
- To increase the knowledge of the group in the areas of cost of production, pasture growth and utilisation, pasture varieties, grazing techniques and sustainability.

SUMMARY OF FINDINGS

Of the four approaches tested to improve productivity, three were able to readily demonstrate achievement of the goal of a 30% to 50% increase.

In summary ...

- Trent and Aaron Long - fine-tuned their grain supplemented, dryland lucerne finishing system, which was able to achieve lamb growth rates in excess of 300 g/d
- Nick and Janelle Edwards - increased lamb growth rates by 55% and achieved 150% increase in lambs reaching sale condition
- Nathan and Penny Craig - were able to turn weight losses for summer fed lambs into weight gains; a 155 g/day per lamb difference (280% increase)

- Bill and Karen Agnew – using feed tests, were able to make savings by not incurring the additional cost of supplementing lambs unnecessarily, and established that bean stubbles can adequately support 200g/d growth rates of carry-over (predominantly) ewe lambs to achieve ‘finished’ specifications in less than 10 weeks
- Mark Buckett – averaged 100 kg per hectare increase in the liveweight of lamb weaned from perennial pastures as a result of increases in both ‘normal’ and ‘intensive’ stocking rates, by up to 100%
- Peter and Elke Hocking - increased weight gain by 32% for lambs finished on a post-harvest, irrigated white clover seed paddock compared to bean stubbles elsewhere on the property
- Neil and Liz Teate - established that lamb production was not affected by different fertiliser regimes, and that at the time of the trial (2008 to 2010), lamb returns were insufficient and input costs were too high to continue finishing lambs on the irrigated perennial pasture

What was done

Seven prime lamb enterprises were involved from across the South East; from Coonalpyn in the Upper South East, to Millicent in the Lower South East, and with a variation in annual rainfall from about 400mm in the north, to about 750mm in the south. Across these sites, four strategies were tested to achieve the objective of improving red meat productivity.

1. Meeting the Nutrient Requirements of Lambs

Trent and Aaron Long at Coonalpyn finished lambs on crop stubbles and lucerne and used feed tests to determine supplementary rations to meet the nutrient requirements of the lambs.

Nick and Janelle Edwards at Avenue Range supplementary fed lambs grazing lucerne pastures with oats and straw to better balance the ratio of energy to protein consumed from the lucerne pasture. Supplementation was informed with the aid of regular feed tests performed on the lucerne. These lambs were compared with unsupplemented lambs grazing an adjoining, similar lucerne pasture.

To better understand the seasonal change in nutrient quality of lucerne and chicory pastures on their property, the Edwards’ also used feed tests to monitor both species across spring, summer and autumn to identify differences with the intent of informing future management practices for the two different pasture types.

Nathan and Penny Craig at Apsley in western Victoria compared supplementary feeding regimes using barley grain to raise the level of nutrition provided to lambs being finished on

either hayed-off ryegrass and clover pastures, or dryland lucerne that was undersown with oats. The provision of barley was targeted to increase energy intake to appropriately meet the requirements of the lambs on both pasture types.

Bill and Karen Agnew at Furner examined how they could use feed test information for pastures to develop a finishing system to more closely match the lambs' nutritional requirements and finish them before the pastures lost their value.

The Agnew's also examined the growth rates of lambs finished on bean stubbles in order to determine what initial starting weight and body condition was required for lambs to be finished adequately on the beans.

2. Intensive Grazing Management of Perennial Pastures

Mark Buckett at Stewart's Range (via Naracoorte) compared a traditionally stocked and managed annual grass and sub-clover pasture containing a small proportion of perennial phalaris, with a rotationally grazed perennial grass and sub-clover pasture.

Breeding ewes were grazed on both pastures throughout the trial, and stocking rates were determined initially from historical figures, and revised to higher levels throughout the trial as Mark's confidence in successfully managing the systems increased.

3. Alternate Finishing Systems

Peter and Elke Hocking at Conmurra compared their traditional system of using bean stubbles to finish lambs over summer, with a new system based on the utilisation of an irrigated seed-producing stand of white clover following harvest.

4. Fertilising Irrigated Pastures

Neil and Elizabeth Teate at Naracoorte, tested two fertiliser regimes on an existing centre pivot irrigated pasture to determine profitable lamb finishing strategies to better utilise their investment in the infrastructure. Based on the result of soil tests, one half of a 28 ha pivot sown to perennial ryegrass was fertilised with the 'normal' phosphorus application rate of 135 kg/ha of single super (~12 kg phosphorus plus 15 kg sulphur per ha), and the other half received urea at a rate of 65kg/ha (~30 kg nitrogen per ha). Lambs were subsequently finished on the pivot over an 86 day period from December to the end of March.

What was found

1. Meeting the Nutrient Requirements of Lambs

Trent and Aaron Long

The Long's achieved a range of lamb growth rates across the duration of their feeding trials, from a high of 322 g/day for lambs fed lucerne pastures that were supplemented with grain and hay on the basis of feed test results to balance the ration, to lows of 69 g/d for lambs grazing forage sorghum supplemented with hay

The benefit of being able to balance the nutrient requirements of the lambs with the nutrition provided by lucerne pastures and supplementary grain and hay proved to be a major positive outcome. By comparison, their previous range of practices often supplied periods of insufficient and excess 'nutrition' during the finishing period as the sheep progressed from grain stubbles supplemented *ad lib* by vetch hay, barley, and lupins, to lucerne pastures with *ad lib* grain and hay. The poor value of sorghum as a finishing fodder was highlighted during the trials, and has been dropped from their enterprise.

Being informed on the nutritional value of the feeds on hand with the aid of feed test results prior to feeding, and using a nutrition calculator to determine an optimum diet before moving onto the feed will continue to provide cost and time savings.

"Our aim from being involved in the trial was to re-evaluate our finishing system for our lambs. Our lambs are August drop, weaned in November and sold from January to April. The previous way to finish our lambs was for them to graze cropping stubbles (quite often hay stubbles followed by bean stubbles and then barley stubbles) whilst being fed vetch hay and having access to a barley/lupin grain mix in self feeders ad lib. The lambs would then change over to Lucerne pastures and continue on the grain and hay feeding regime."

"We had suspected that the intensive grain feeding of our lambs on cropping stubbles and then finishing on lucerne had previously been excessive due to the high quality lucerne the lambs were grazing, but it had seemed to work very well for the past 5-10 years that Dad and Grandpa had done this practice but was very time consuming and costly (due to growing barley and unprofitable lupin crops JUST to feed lambs). After discussion with Penny Craig, we became involved in the project to learn more about matching feed to animal requirements."

Nick and Janelle Edwards

In their supplementation trial, supplemented and unsupplemented groups of lambs were grazed on similar stands of lucerne. Regular feed tests of the lucerne were performed and the lambs in the supplemented group were provided with oats and straw to better balance the protein and energy supply to more closely reflect the nutritional needs of the lambs.

The result was that the supplemented group grew at 288 g/hd/day compared to 186 g/hd/day for the unsupplemented group that received only barley straw – an increase of 55%. Consequently the treated group averaged 2.4 kg per head more than the control group over the supplementation period.

This difference was valued at \$4,000 more for the lambs sold from the supplemented group due to 1.5 times more lambs reaching a marketable condition from this group (152 vs 104). Supplementation came at a cost of only \$800.

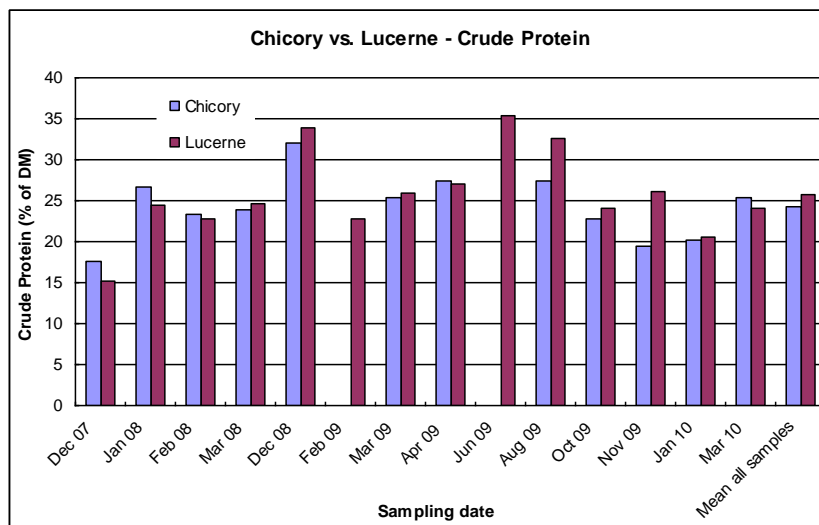
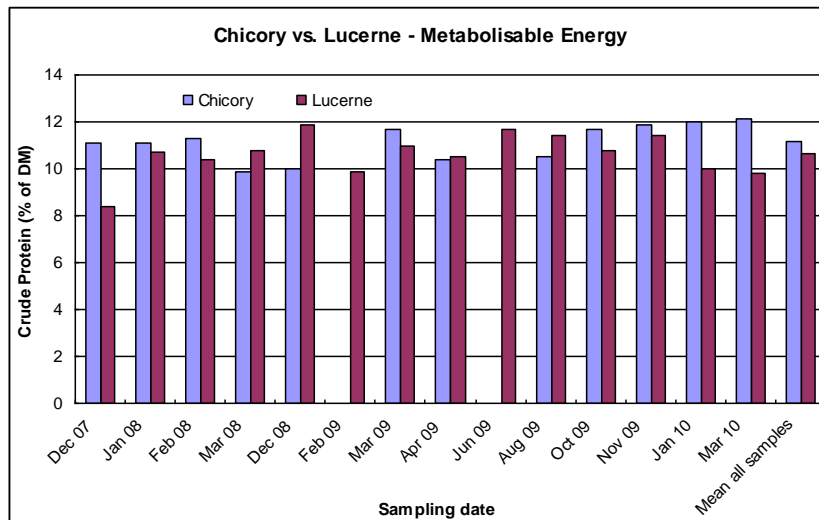
“We expected a productivity gain but were surprised by how much better the treatment lambs went, as it was difficult to know exactly what they would do based on the lack of good industry information.”

In addition to the feeding trial, the Edwards' efforts have provided a useful insight to the comparative seasonal nutritional value of chicory and lucerne when grown under the same conditions. Over three years, samples collected from both species at the same time have shown a wide variation in quality between collection dates. For example, crude protein in lucerne samples varied from 15% to 33% CP (average = 24%), and chicory from 18% to 32% (average = 24%); with very similar results for both species.

The interesting difference comes with energy. For the lucerne samples, metabolisable energy varied from 8.4 MJ to 11.9 MJ, with an average across all samples of 10.4 MJ. By comparison, chicory has covered the range from 9.9 MJ to 12.1 MJ, with an average of 11.1 MJ; 0.7 MJ higher than lucerne on average.

When these data are applied in a growth modelling tool (Grazfeed), it suggests that chicory fed lambs are likely to gain weight at least 10% faster than lucerne fed lambs. However, the lamb growth model tends to overestimate the growth potential of lambs on lucerne. This is because of the often highly soluble nature of the protein in lucerne that tends to limit digestive efficiency and hence lamb growth rate. In the paddock this frequently translates as lambs growing at less than 200 g/day when their potential gain is suggested to be 300 g/day+. Hence the common and well proven recommendation is to provide a grain supplement, such as oats or barley to lambs grazing lucerne.

In fact, this phenomenon was observed by Nick and Janelle in their feeding trial. When they used oats and straw to supplement their lambs grazing lucerne pastures, lamb growth rates were about 100 g/hd/day higher than unsupplemented lambs.



With chicory being more widely acknowledged as a viable alternative or complementary to lucerne in a mixed pasture, and with chicory's range extending to more acid soils than lucerne at present, the implications for lamb finishing using chicory as a pasture are substantial. These implications may be further bolstered since it is also currently thought that chicory does not require the same 'balancing grain supplement' that is required for lucerne fed lambs to achieve their high potential growth rates (for example <http://www.dpi.nsw.gov.au/agriculture/field/pastures-and-rangelands/species-varieties/factsheets/chicory/part-e>).

Nathan and Penny Craig

Nathan and Penny were able to demonstrate the superior inherent nutritional value of dryland lucerne undersown with oats compared to a hayed-off ryegrass and clover pasture during summer in Western Victoria.

However, it appears that the Craig's trial was affected by poor adaptation of the lambs to the barley (grain) supplement, and although the lambs on the dryland lucerne achieved daily growth rates that were 155 g/head/d higher than the hayed-off ryegrass pasture, growth rates were generally poorer than anticipated. It was suspected that sub-clinical acidosis was an influencing factor.

	Summer Finishing System	
	Hayed-off Ryegrass/clover pasture + 200 g/d barley (grain)	Lucerne undersown with oats + 200 g/d barley (grain)
Number of lambs	255	236
Daily weight gain per head	-55 g/d	100 g/d
Weight gain per ha	-306 kg	520 kg
Net financial return per ha	- \$581	\$988

Bill and Karen Agnew

In most years, Bill and Karen's lambs run out of good quality pasture before they are finished to a satisfactory market specification, hence their initial trial focussed upon using information about the quality of the pasture on offer to develop a supplementation regime that would better match the lambs requirements as they were finished. Using the feed test information, it was evident that during the trial year, pasture quality remained very high for the duration, and thus lambs achieved finishing weights without the need for additional supplements. For the investment in the feed test information, the savings pay off was the knowledge that unnecessary supplementation was not required. Pasture on offer averaged 30% crude protein and 10.5 MJ of metabolisable energy (ME) in mid-September, and 26% protein and 10.5 MJ of ME at the end of October.

The Agnew's bean stubble trial was aimed at evaluating whether there was an ideal starting weight for their unfinished 'carry-over' lambs to be placed on the beans and to then achieve a slaughter specification in an adequate timeframe. During the trial, the lambs achieved a daily weight gain of 191 g/head/day for the 67 days that they had access to the bean stubble, and achieved a 0.8 unit gain in condition score in the first 40 days.

	2 nd Feb	14 th Mar	10 th Apr
Condition Score	1.5	2.3	Not measured
Weight (kg)	36.1	43.8	50.0
Average Total Gain (kg)	2 nd Feb to 14 th Mar	14 th Mar to 10 th Apr	2 nd Feb to 10 th Apr
Average Daily Gain (g/d)	7.5	5.5	12.8
	193	203	191

During the trial, it emerged that the bulk of the carry over lambs in the flock were ewes, with only 11% wethers. This was new information for Bill and Karen.

The trial suggested that for these lambs, there were poor relationships between starting liveweight and daily growth rates and total weight. This tends to suggest that irrespective of the starting weight of the lambs before they went onto the beans, lambs had similar growth rates for the duration of the feeding period, and gained similar amounts of weight.

Consequently, rather than starting with a set minimum liveweight, a more suitable starting point to determine which lambs to put onto beans stubbles in the future may be to determine what specifications are required for the finished lambs to reach, establishing the 'carrying capacity' of the bean stubbles, and stocking the stubbles appropriately in order to ensure that lambs placed on the stubbles can reach the desired specification.

2. Intensive Grazing Management of Perennial Pastures

Mark Buckett

Following the introduction of an intensive rotational grazing system at the trial site, Mark has been able to closely observe both pasture and animal responses to the changes that have been implemented.

The key results at this site are a 44-100% higher stocking rate, 78% more lambs weaned and an average 23% increase in the weight of lamb weaned from the Intensive Rotation paddock than the Normal Stocking paddock (100 kg liveweight/ha). Pasture composition has not changed significantly between the two paddocks, with the main changes in these animal production measurements coming about as a consequence of the adoption of rotational grazing in the Innovation paddock.

Moreover, Mark also achieved a 44% increase in stocking rate in the Normal paddock as a direct result of better and timelier management of the sheep and the pasture.

This trial has been a very clear and outstanding demonstration of the potential for improved management and rotational grazing to achieve significant increases in animal productivity and business profit.

Year	Control – ‘Normal’ Stocking		Intensive Rotation		Estimated \$/ha gain
	Stocking rate	Kg/lamb/ a	Stocking rate	Kg/lamb/ ha	
2008	9 DSE	288	13 DSE	354	\$94 (@ \$3.16/kg dressed)
2009	11 DSE	471	16 DSE	587	\$208 (@ \$4.00/kg dressed)
2010	13 DSE	599	18 DSE	718	\$230 (@ \$4.20/kg dressed)

The strong results from this site have had a real impact on SEPLA members, with most indicating they will look more closely into rotational grazing on their own properties in the future.

3. Alternate Finishing Systems

Peter and Elke Hocking

The Hocking’s made use of the valuable opportunity provided by the PIRD to examine how they could make further use of their investment in an irrigated small seeds enterprise; that is a white clover stand situated underneath a centre pivot irrigator. Following harvest of the seed, the opportunity existed to test the use of the established white clover stand to finish lambs, and this was compared to their traditional system based on finishing lambs on bean stubbles.

Results from the trial demonstrated that significant value was able to be extracted from their investment in the pivot for the small seeds crop by being able to achieve per ha margins that exceeded their traditional bean stubble finishing system, by \$123/ha (27%).

	# of lamb s	\$/head	\$/kg Cwt	Kg Lwt	Kg Cwt	Kg gain during finishing	Days on feed	Kg Lwt/ha	Kg cwt/ ha	\$/ha
White Clover Pivot	1,110	\$89	\$3.80	53	23.5	14.9	93	344	153	\$578
Bean Stubble	1,149	\$101	\$3.90	57	26	12.8	77	253	116	\$455

Both finishing systems supported similar daily growth rates by lambs (160 v. 166 g/d for the white clover and bean stubble, respectively).

Feed testing of the white clover pasture has provided surprising results for the producers; the underlying nutrient content of the white clover (at 11.3 MJ of metabolisable energy and 24% protein) suggested that substantially higher lamb growth rates than the 160 g/d observed are possible on this forage.

Upon reflection, this likely indicates that issues such as excess soluble protein may be limiting feed conversion efficiency, and a supplementary feeding strategy that addresses this apparent imbalance could benefit lamb growth rates and profitability further.

4. Fertilising Irrigated Pastures

Neil and Elizabeth Teate

The Teates have noted that in recent years the apparent productivity of lambs finished on their irrigated perennial ryegrass pasture has been below what they expect, and have suspected declining soil fertility as a potential cause.

Two fertiliser treatments were tested in the PIRD activity; a) alternative treatment - urea applied at 65 kg/ha (30 kg N/ha), and b) normal practice (control) - single super applied at 135 kg/ha (12 kg/ha P and 15 kg/ha S).

	Fertiliser applied	
	30kg Nitrogen /ha	12 kg Phosphorus /ha (& 15kg Sulphur)
Number of lambs finished	574	618
Average weight of lambs	50.5 kg	50.1 kg
Total liveweight finished	29,009 kg	30,958 kg
Liveweight per ha	2,072 kg/ha	2,211 kg/ha
\$ per ha returned (@ \$1.90/kg live)	\$3,937	\$4,201
Fertiliser cost per ha	\$37	\$39
Net return per ha*	\$3,900	\$4,162

**Note: Excludes operating costs of the pivot*

The aim of the alternative (urea) treatment was to examine if urea could be used tactically to increase feed supply and quality, and thus the productivity of the lambs on the pastures.

The results (above) were not able to distinguish an advantage to the urea treatment under the trial conditions.

Feed test results provided some explanation for the observed slightly higher level of performance of lambs on the control (single super) pasture, with metabolisable energy levels 0.8 to 1.1 MJ higher on the control pasture (7.8 v. 8.6, and 11.8 v. 12.9 MJ, respectively during January and February), and crude protein levels 3.6 to 3.7 % higher on the control pasture (11.6 v. 15.2, and 26 v. 29.7%, respectively during January and February). Interestingly, pasture quality was significantly higher on both areas during February compared to January (by about 4 MJ of metabolisable energy, and 14% crude protein).

As a consequence of this learning experience, the Teates were not able to justify changing their fertiliser practice under the prevailing circumstances.

'Based on the results of the trial, it wasn't obvious that there was any benefit from either of the fertiliser treatments, and in this particular year, it wasn't economic to keep finishing lambs under irrigation.'

‘We also use bean stubbles to finish lambs, so until the economics change, we will tend to make use of the beans in preference to the pivot’