Boosting Liveweight Gain For Lambs Grazing Lush Lucerne Through Supplementation - Winchelsea, Vic

Location: "Murdeduke" Winchelsea, Victoria

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Summary of Findings:
Lambs grazing lush lucerne and supplemented with pellets gained significantly more weight than lambs grazing lucerne only. The weight gain from a commercially available weaning pellet was 67 gm/hd/day above the control (lucerne only) and 55 gm/hd/day above the control for an experimental pellet formulated by Latrobe University. Pellets were fed at 100 gm/hd/day over an 8 week period.

The financial gain from the experimental pellet was $2.49/hd compared with a loss of $3.49 from feeding the commercial weaning pellet.

Background:
Lucerne is increasing in popularity as a long term break crop in a cereal-canola rotation. It is envisaged a typical crop rotation may be one or two cycles of canola-wheat-barley followed by up to three years of lucerne. The lucerne would provide the opportunity to address difficult to control weeds such as annual ryegrass and act as a disease break. The other benefits of lucerne in a crop rotation include:

- Aggressive deep roots that deplete soil moisture to a point where winter rainfall will not replenish to saturation in the crop phase, thereby preventing the soil becoming waterlogged.
- the accumulation of significant amounts of nitrogen in the soil profile
- root pathways for subsequent crops created by decaying lucerne roots
- the opportunity to utilise 'out of season' summer feed in conjunction with a dedicated fattening system.

Farmers who have tried this perennial break crop report two major difficulties that need to be overcome if the potential of lucerne is to be fully realised.

The first is the need to increase the growth rates of lucerne in winter. The second is the disappointing growth rates of lambs grazing lush, high quality lucerne. Given the quality of the feed on offer, growth rates should be significantly higher than most farmer's experience.

Theoretical liveweight gains of lambs should consistently exceed 350g/hd/day, however in practice 250g/hd/day is rarely exceeded.

Several theories are offered as to why lamb growth rates on lush lucerne are less than optimum, but most opinion refers to animal health issues such as redgut or dietary imbalances related to energy, protein, minerals and fibre.

Trials conducted by Grain and Graze in 2005/2006 showed a commercially available weaning pellet dramatically increased lamb growth rates when livestock were grazing lush lucerne (SFS results book, 2006). However the cost of the pellets exceeded the financial gain from the additional weight gain.

This trial is testing an experimental pellet produced at 25% of the price of the previously used weaning pellet.

Methodology:
A large 'uniform' lucerne paddock was sub divided into three equal areas. In two areas troughs were erected to feed the pellets.

The three treatments used were:
- ELMS weaning pellet fed at 100gm/hd/day (used successfully in the 2005/2006 trial)
- A 'Latrobe' pellet fed at 100 gm/hd/day
- A control (no pellets)

Fifty lambs were randomly assigned to each treatment group from a mob of 350 animals. Each lamb was electronically tagged so weights could be assigned to each animal at each weighing.

Before the lambs were weaned, imprint feeding was conducted to acclimatize the animals to eating pellets. The lambs were then weaned using a standard weaning protocol (see later). Once weaned the lambs were confined in their treatment group with the two treatment groups fed their respective pellets and the control group which received another commercial weaning pellet. The three treatment groups were contained for a week and then moved to their respective paddocks where supplementation ceased for the control mob and continued for the other two mobs.

Lambs were weighed weekly. Twice during the eight week period (week 4 and 8) a blood sample was taken from 12 lambs from each mob. At the conclusion of the trial the same lambs were condition scored and killed with their stomach contents and livers being analyzed.

The trial was designed to commence at the height of the spring flush when the lambs were experiencing their biggest nutritional challenge from the lucerne. The trial commenced in early October and ran through to early December.

The lucerne in each sub paddock was measured for drymatter at quality four times during the trial period.

Weaning inputs:
- 5 in 1 @ 2ml/hd
- Virbamec Oral plus Selenium @ 8ml/hd
- Vitamin B12 @ 2ml/hd
- Vitamin A,D,E @ 1ml/hd
- All lambs electronically tagged

Paddock treatments :
- **Treatment 1:** No supplementation (control)
- **Treatment 2:** A pellet developed in conjunction Latrobe Uni which incorporated an 'ammonia sponge' and a number of trace elements, minerals and vitamins to be fed at 100 gms/hd/day.
- **Treatment 3:** Commercially available lamb weaning pellet (ELMS Lamb Weaning Concentrate Pellet available from Elders) containing buffers, rumen modifiers, vitamins and trace elements fed at 100 gms/hd/day. The treatment is aimed at reducing physiological and nutritional stress for up to 50 days post weaning.

The digestibility and protein of the pellets used is listed (Table 1).

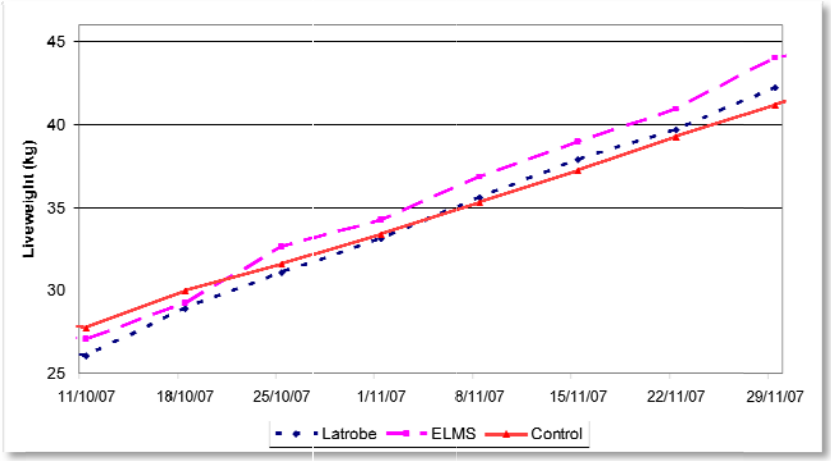
▼ Table 1: The digestibility and protein of the ELMS weaning pellets and Latrobe pellets

Treatment	Digestibility (%)	Crude Protein (%)
ELMS weaning pellet	52.7	9.8
Latrobe pellet	62.7	8.6

Results:
Mobs offered the supplementary pellets grew significantly more compared to the mob offered no supplementation (Table 2).

▼ Table 2: Mean weight gain of lambs supplemented with ELMS weaning pellets or Latrobe pellets and no pellets (lucerne only)

Treatment	Weight gain over trial period (kg/hd)	Daily weight gain (gm/hd/day)
ELMS weaning pellet	17.04	346
Latrobe pellet	16.10	330
Nil (lucerne only)	13.22	274
$LSD_{0.01}$	**1.23**	



▲ **Figure 1: Change in liveweight during trial period**

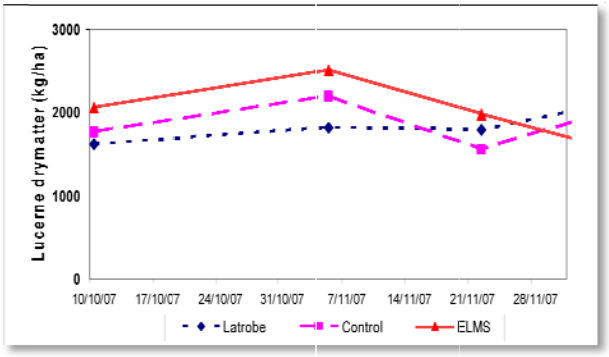
The weight gain was consistently greater in the two supplemented mobs, even though the mobs offered the pellets were lower average entry liveweight (Latrobe pellet mob 1.6kg less than control and ELMS weaning pellet mob 0.6 kg less than control) (Figure 1).

▼ **Table 3: Fat score of different treatments**

Treatment	Animals in fat score 2 (%)	Animals in fat score 3 (%)	Animals in fat score 4 (%)
ELMS weaning pellet	**0**	**83**	**17**
Latrobe pellet	**23**	**38**	**38**
Nil (lucerne only)	**18**	**73**	**9**

An independent assessor fat scored a subset of lambs before slaughter. Increased fat score corresponded with the mobs receiving either the ELMS weaning pellet or the Latrobe pellets (Table 3)

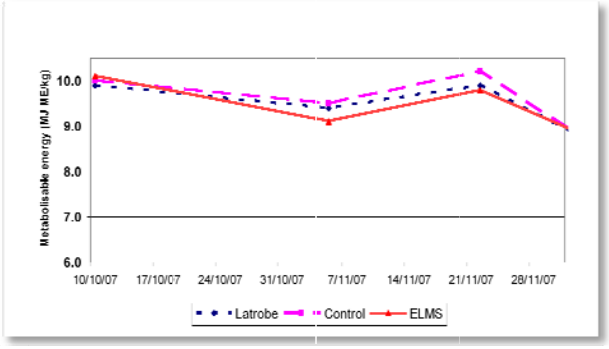
The weight gain recorded will be influenced by the quality and quantity of feed on offer to the grazing animals as well any additional energy and protein in the pellets.



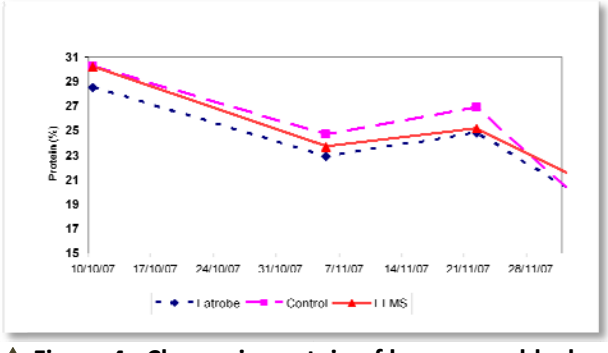
The three mobs grazed paddocks that were not identical in quantity of lucerne. The mob being supplemented with the ELMS weaning pellets were offered more drymatter than the control or the mob grazing the Latrobe pellets (Figure 2). This additional drymatter offered to the mob supplemented with the ELMS weaning pellets remained for most of the trial.

◀ **Figure 2: Change in drymatter of lucerne paddocks during the trial period**

The quality of lucerne offered to the three mobs, measured by energy and protein, was very similar (Figure 3 and 4). Energy ranged from 9 to 10 MJ ME/kg, however protein declined from around 30% at the start of the trial to 21% at the conclusion. The spike in energy and protein towards the end of the trial was caused by 67 mm of rain falling in early November, creating a flush of new green leaves.



▲ **Figure 3: Change in energy of lucerne paddocks during the trial period**



▲ **Figure 4: Change in protein of lucerne paddocks during the trial period**

The results from Table 4 indicate the difference in lucerne quality and quantity between the three mobs had a small impact on predicted weight gain. The lambs receiving the ELMS weaning pellets were grazing a higher quantity of lucerne which added 4 gm/hd/day to their growth rate compared to the control mob. In contrast the lambs receiving the Latrobe pellets were grazing lucerne with a slightly lower drymatter content, resulting in a 1 gm/hd/day penalty in growth compared to the control. The energy and protein in the pellets only had a small influence on weight gain.

This means the large difference in weight gain recorded must be occurring due to the other effects from the pellets. The two pellets had a positive effect on liveweight gain that could not be accounted for by differences in the lucerne offered to these mobs or by the additional energy and protein in the supplement.

Significant rain in early November resulted in vigorous and lush growth of lucerne.

This vigorous and lush growth provided a major nutritional challenge to the grazing animals.
It was observed that 45 % of the control lambs (lucerne only) experienced heavy scouring while less than 10% of the lambs receiving either pellet showed signs of scouring. Several lambs in the control group showed clinical signs of red gut including lethargy and unsteadiness at various stages during the trial.

This result is significant and supports the results identified from previous work (SFS trial results 2006). It would appear the use of the supplement increases the conversion of the feed into liveweight.

A simple partial budget illustrates the costs and returns of using the two different pellets. The cost of the ELMS weaning pellet was $1,960 per tonne and the Latrobe pellet was $520 per tonne, although the cost of the Latrobe pellet is anticipated to be greatly reduced if the pellet was manufactured in commercial quantities. The liveweight gain was valued at $3.65/kg carcass weight ($1.75/kg lwt). No feeding out costs were included.

▼ Table 4: Influence of differences in lucerne quality and quantity and supplementation on liveweight gain

Treatment	Influence of differences in lucerne (gm/hd/day)	Influence of pellet (gm/hd/day)	Measured weight gain (gm/hd/day)	Adjusted weight gain (to include the effects of the differences in lucerne and pellets (gm/hd/day)
ELMS weaning pellet	+ 4	+1	346	341
Latrobe pellet	-1	+ 2	330	329
Nil (lucerne only)	0	0	274	274

▼ Table 5: Simple partial budget for ELMS weaning pellets and Latrobe pellets

	Adjusted weight gain (gm/hd/day)	Adjusted weight gain above control (kg/hd)	'Value' of this additional gain ($/hd)	Quantity of pellets fed (kg/hd)	Financial gain ($/hd)
ELMS weaning pellets	341	3.49	$6.11	4.9 kg	-$3.49
Latrobe pellets	329	2.88	$5.04	4.9 kg	$2.49

The potential influence of the quantity and quality differences in the lucerne offered to each mob plus the additional value from the two types of pellets was examined using Grazfeed (Grazfeed is a CSIRO developed computer model which predicts livestock performance. It allows livestock performance to be calculated based on changing feed quality, quantity, supplementation and livestock details).

The predicted impact on measured weight gain compared to the control is presented (Figure 4). If the lucerne on offer was less than the control, then the difference in predicted growth rate should be added to the treatment mob.

▼ Photo 1: Lambs were killed and samples taken to determine what effect the pellet supplementation was having

If the quality and quantity of the lucerne was greater than the control, the additional predicted liveweight gain was subtracted from the treatment mob. The energy and protein in the pellets were also examined and the influence on growth rate adjusted.

The reason for the improvement in liveweight remains unclear. When an animal consumes protein in excess of their requirements, the excess is absorbed into the blood as ammonia and is then processed by the animal and excreted in the urine. The process of excreting the excess ammonia uses energy that could otherwise be used for growth. Trials in 2006 attempted to add additional energy to the diet, but difficulties were encountered with the animals eating sufficient quantity to compensate for the suspected energy loss from excreting the excess protein.
In this trial the Latrobe pellet contained an 'ammonia sponge', which was designed to soak up the excess ammonia in the bloodstream and therefore avoid the need for the animals to process the excess nitrogen. It was assumed the extra energy would then be used for growth.

While this explanation remains feasible, it has not been confirmed. Blood samples, rumen digestive contents and liver samples were taken after slaughter but results were not available at time of publication. This analysis is continuing with researchers from Latrobe University.