INCREASING LAMB GROWTH RATES ON LUSH LUCERNE THROUGH SUPPLEMENTATION - WINCHELSEA, VIC

NB: A detailed set of notes is available from the SFS website http://www.sfs.org.au/Grain&Graze.htm

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"Murdeduke", Winchelsea, Victoria

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Background/Objectives:
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 utilised 'out of season' summer feed in conjunction with a dedicated fattening system.

Background (continued)…
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 (refer to trial Animal Production From Sowing Cereals Into Established Lucerne During Winter - Woorndoo). The second is the disappointing growth rates of lambs grazing lush, high quality lucerne. Given the metabolisable energy on offer, growth rates should be significantly higher than most farmers 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.

These trials seek to improve lamb growth rates on lush lucerne through supplementation.

Rainfall (mm): Not Applicable

Summary Of Findings
The addition of a small amount of weaning pellet to lambs grazing lush lucerne (protein to energy ratio above 2.2) increased growth rates by more than 100gm/day over lambs grazing the equivalent amount of lucerne only. The availability of addition energy (as barley) or fibre (barley straw) made no difference to growth rates as intake of both supplements was low. The effect of the weaning pellet on liveweight gain ceased when the lucerne began to 'harden' (protein to energy ration approximately 2.0).

While the results are spectacular, the cost of the pellets ($1860/tonne) makes their use marginal. Further work is being conducted through the Grain and Graze program to develop a low cost pellet that gives a similar effect.

Trial Design:
Three trials were undertaken. The first commenced in mid November 2005 and concluded in early December. The lucerne grazed was lush and plentiful at the start of the trial. Difficult seasonal conditions (no rain), aphid attack and shearing in mid December resulted in the first trial concluding earlier than anticipated (21 days only).

After shearing, further lucerne paddocks were found and a modified trial recommenced in January 2006 using the same lambs but with a reduced number of treatments. The second modified trial was undertaken but involved grazing smaller quantities of less digestible lucerne. The lucerne in this trial appeared stressed and not as lush as trial 1. The second trial ran for 14 days until the available lucerne was consumed.

After summer rain a third trial was commenced in late February and completed on March 22, 2006 using a new mob of lambs (26 days). The lucerne was limited in quantity but similar in quality to the first trial ie. Lush leafy lucerne, although its quality declined rapidly. Only two treatments were examined given the limited availability of lucerne.

TRIAL 1 – GRAZING PLENTIFUL LUSH LUCERNE

Four treatments were applied. These were:

- **Treatment 1:** No supplementation (control)
- **Treatment 2:** Fibre (barley straw) fed ad lib and offered in large square bales.
- **Treatment 2:** High energy, low fibre concentrate (barley grain) presented in a trail and intended to be fed at 450gms/hd/day.
- **Treatment 4:** Commercially available lamb weaning treatment[1] involving injections of vitamins A,D,E and B12 plus a pellet containing buffers, rumen modifiers, vitamins and trace elements intended to be fed at 100 gms/hd/day (it was intended to use a loose lick product but the lambs refused to consume it). The treatment is aimed at reducing physiological and nutritional stress up to 50 days post weaning.

The content of the different treatments is listed (Table 1). The barley and hay supplements were analysed by Feedtest , with the ELMS Lamb Weaning Concentrate Pellet based on the product label.

Table 1: Drymatter, Feed Quality And Other Components Of Treatments Used

Treatment	Dry Matter (%)	DDM (%)	Crude Protein (%)	Energy (MJ ME/kg)	Other	Cost ($/t)
Straw, barley	89.3	59.0	3.5	8.0		$80
Grain, barley	89.0	85.5	12.1	13.0	ADF – 5.6%	$150
Weaning pellets + Vit A,D,E and B12 injection	N/A	N/A	9.3	8.6	Organic and inorganic minerals, vitamins and vegetable oil	$1860 for pellets + $29c/hd injection

Four paddocks of similar size with similar quantities and densities of lucerne were chosen. Each paddock was tested prior to the trial commencing and again at the end of the grazing period (Table 2 and Table 3).

Table 2: Feed Quality And Quantity On Day 1

Treatment	Drymatter (%)	DM (kg/ha)	DDM (%)	Protein (%)	Energy (MJ ME/kg)
Control	17.1	3801	70.1	29.6	10.5
Straw	19.2	3130	68.3	26.7	10.1
Barley	19.3	3406	68.4	27.9	10.2
Weaning pellets	17.8	3361	69.0	27.2	10.2
Average	**18.4**	**3425**	**69.0**	**27.9**	**10.3**

Table 3: Feed Quality And Quantity On Day 21

Treatment	Drymatter (%)	DM (kg/ha)	DDM (%)	Protein (%)	Energy (MJ ME/kg)
Control	43.0	1510	61.9	22.0	N/A
Straw	45.0	1687	62.6	22.6	N/A
Barley	47.0	1863	63.2	23.1	N/A
Weaning pellets	45.0	1687	62.6	22.6	N/A
Average	**45.0**	**1687**	**62.6**	**22.6**	

[1] ELMS Lamb Weaning Concentrate Pellet available from Elders

Lambs were second cross July drop lambs (Merino Border Leister dams X White Suffolk rams). Lambs were allocated to the treatment areas through a simple 4 way draft, having an average liveweight of 33.7 kg at the start of the trial. The stocking rate was set at 20 lambs/ha, resulting in approximately 200 lambs in each mob.

Imprint feeding of grain and pre-conditioning to the lucerne after weaning (for three weeks) occurred to all mobs of lambs before drafting into the four treatments. All lambs had received a vitamin A,D,E and B12 injection at marking, 5 weeks before the first trial commenced.

Lambs were drenched with *Virbamec* (an avomectin drench). To eliminate the possible confounding effect of internal parasites, the lambs were drenched at approximately three week intervals during the course of the trial.

Modifications To The Original Treatments:

There was difficulty in getting the animals to eat the various supplements offered while grazing the lucerne. These difficulties encountered for each treatment were:

- Straw - Observations would suggest the lambs ate very little of the straw on offer and tended to use the material for 'entertainment'.
- Barley – The intention was to build up to feeding a barley grain ration of 450gm/hd/day. In trying to attain this level of feeding significant wastage was encountered and rates were cut back to a point where acceptable levels of wastage occurred. It was estimated the lambs only ate 30 gm/hd/day in week 1, 50 gm/hd/day in week 2 and 80 gm/hd/day in week 3. This is despite the imprint feeding pre-weaning.
- Weaning pellets - The intention was to feed this as a loose lick but this was not accepted by the lambs so similar pelletised form of the product was used. The prescribed treatment rates were also never achieved, with consumption very similar to the barley treatment (ie. 30, 50 and 80 gms/hd/day in weeks 1, 2 and 3 respectively).

Results

The liveweight gain over the 21day period is shown below:

Table 4: Measured Change In Liveweight Over Trial Period

Trt	Starting weight 17/11/05 (kg)	Finishing weight 8/12/05 (kg)	Weight gain (kg)
Control	34.0	39.9	5.9
Straw	33.2	39.2	6.0
Barley	33.9	39.7	5.8
Weaning pellets	33.8	41.4	7.6

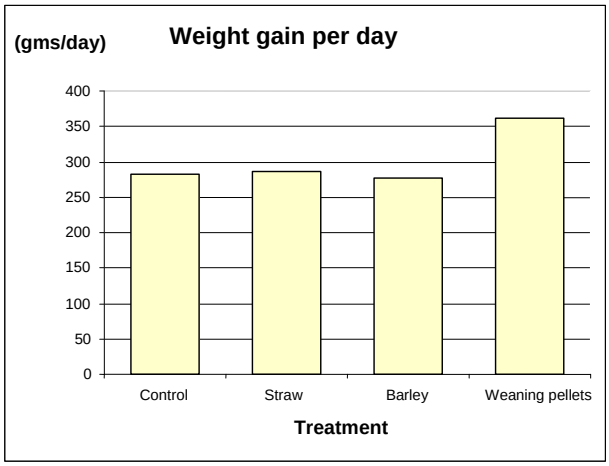

Figure 1: Measured Liveweight Gain For Lambs

TRIAL 2 – GRAZING 'HARDENED' LUCERNE

The first trial was modified after shearing partly due to the results from the first trial and partly because of the limitation of additional lucerne paddocks. The straw and barley treatments were combined and the lambs from these previous treatments boxed together. This left three treatments remaining:

- **Treatment 1:** No supplementation (control)
- **Treatment 2:** Fibre (barley straw) fed ad lib and offered in large square bales and high energy, low fibre concentrate (barley grain) presented in a trail and fed at 100 gm/hd/day.
- **Treatment 3:** Weaning pellets fed at 100gm/hd/day.

The same lambs used in trial 1 were used in trial 2, with an average liveweight of 44.5 kg at the start of the trial. The stocking rate was set at 20/ha, resulting in approximately 210 lambs in treatments 1 and 3 and 370 lambs in the combined treatment 2. The trial continued for 14 days.

Three new paddocks were sourced. One of these treatments required a collection of smaller lucerne paddocks to be used. Gates were opened between these smaller paddocks allowing grazing of all paddocks at the same time.

The lucerne on offer to the lambs at the start and completion of this trial period are listed (Table 5 and Table 6).

Table 5: Feed Quality And Quantity On Day 1

Treatment	Drymatter (%)	DM (kg/ha)	DDM (%)	Protein (%)	Energy (MJ ME/kg)
Control	45.2	1677	59.7	18.0	9.1
Straw & Barley	31.8	2452	68.3	20.9	10.1
Weaning pellets	38.5	2065	64.0	19.5	9.6

Table 6: Feed Quality And Quantity On Day 14

Treatment	Drymatter (%)	DM (kg/ha)	DDM (%)	Protein (%)	Energy (MJ ME/kg)
Control	63.5	495	56.3	14.9	8.1
Straw & Barley	39.8	533	61.5	22.3	9.5
Weaning pellets	51.7	514	58.9	18.6	8.8

Results

The liveweight gain over the 14 day period is presented in Table 7 and Figure 2.

Table 7:Measured Change In Liveweight Over Trial Period

Trt	Starting weight 28/12/2005 (kg)	Finishing weight 11/01/2006 (kg)	Weight gain (kg)
Control	44.8	47.4	2.6
Straw & barley	43.8	48.1	4.3
Weaning pellets	44.9	48.9	3.9

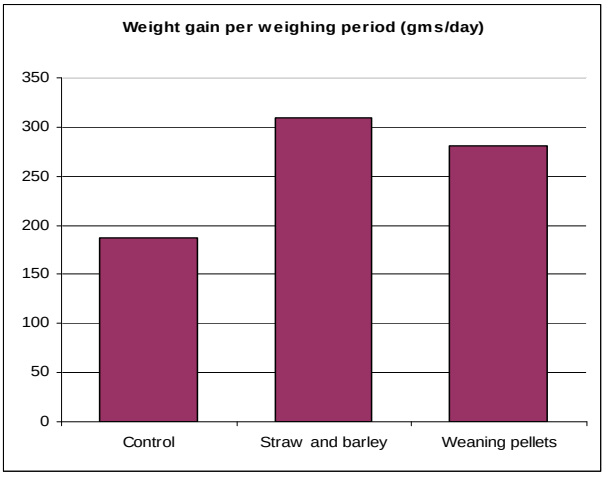

Figure 2: Measured Liveweight Gain For Lambs

TRIAL 3 – GRAZING SHORT LUSH LUCERNE

The results from the first two trials suggest an improvement in lamb growth rates on lush lucerne using the weaning pellets as a supplement. A third trial was established using an August drop mob of lambs at average weight of 38.9 kg.

Two treatments were tested

- **Treatment 1:** No supplementation (control)
- **Treatment 2:** Weaning pellets plus injections of vitamins A,D,E and B12 fed at 100 gm per day.

Four paddocks were used in the trial, the first pair of paddocks were grazed for 16 days and the second pair for 12 days. More than 350 lambs were used in each treatment group.

The lucerne on offer to the lambs at the start and completion of this trial period are listed (Table 8 & Table 9).

Table 8: Feed Quality And Quantity At Start Of Grazing

Treatment	Drymatter (%)	DM (kg/ha)	DDM (%)	Protein (%)	Energy (MJ ME/kg)
Control	31.7	532	70.9	23.6	10.6
	35.9	582	69.1	22.5	10.3
Weaning pellets	37.5	338	76.7	31.2	11.6
	32.9	974	70.9	23.6	10.6

Table 9: Feed Quality And Quantity At The End Of Grazing

Treatment	Drymatter (%)	DM (kg/ha)	DDM (%)	Protein (%)	Energy (MJ ME/kg)
Control	38.2	160	53.1	16.0	7.8
	69.7	195	34.0	8.1	4.2
Weaning pellets	58.5	515	47.6	16.1	6.7
	43.4	122	55.3	13.6	7.9

Results:

The liveweight gain over the first 16 and following 12 day period is presented (Table 10 & Figure 3)

Table 10: Measured Change In Liveweight Over Trial Period

Treatment	Starting weight 22/02/2006 (kg)	Interim weight 10/03/2006 (kg)	Finishing weight 22/03/2006 (kg)	Weight gain (kg)
Control	38.9	42.2	45.1	6.2
Weaning pellets	38.9	44.4	48.8	9.9

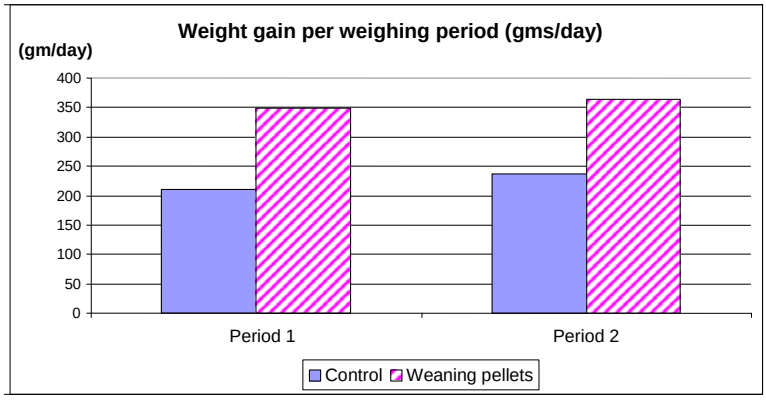

Figure 3: Measured Liveweight Gain For Lambs

Discussion

The trials conducted on *Murdeduke* were of a commercial scale which means the lucerne available to the grazing animals varied slightly from paddock to paddock and over time. It is well established that small differences in feed on offer (quantity and quality) ***will*** influence the animal performance. ***Therefore we stress the liveweight changes of the lambs in these trials need to be examined in conjunction with the quality and quantity of feed offered to the lambs.***

To assist in understanding the influence the various supplements had in these trials, the Grazfeed computer model *(Grazfeed is a CSIRO developed computer model which predicts livestock performance. It allows livestock performance to be calculated based on changing pasture quality, quantity, supplementation and livestock details)* was used to calculate predicted animal performance. The predicted result was compared to the measured result from the paddock. This allowed identification of liveweight change that could not be explained by Grazfeed and may be due to improvements in animal health and/or enhanced feed conversion.

The three trials indicate a positive response to adding weaning pellets to lambs, but only when grazing 'lush' lucerne. The feed was considered 'lush' if the digestibility was around 70% and protein in excess of 25%. The response to the weaning pellets occurred when the protein to energy ratio was 2.2 or greater. This was the case in the first and third trials. In the second trial where no response was obtained to feeding weaning pellets, the protein to energy ratio was approximately 2.0.

Providing barley straw to the lambs grazing lucerne made no discernible difference to liveweight gain. The measured difference between the control and the straw / lucerne treatment was only 5 gm/hd/day. Grazfeed calculations predicted this 5 gm/hd/day improvement.

The difficulty in getting the lambs to eat large quantities of barley limited the result of using this treatment. It was estimated each animal consumed a total of 1.1 kg of barley during the first trial. At such low levels of consumption, it is not surprising the treatment appears to have little influence on liveweight gain.

The weaning pellets, in conjunction with the vitamin A,D,E and B12 injection resulted in liveweight gains well in excess to that predicted by Grazfeed. Given the quality and quantity of lucerne these lambs were grazing, the treatment has increased growth rates during the 21 day period by 80 gm/hd/day over the average of the other treatments. The increase in liveweight cannot be attributed to increased energy intake through the weaning pellets. This would suggest an improvement in the efficiency of converting the consumed lucerne into liveweight gain.

The quality and quantity of feed offered to the lambs at the start of the second trial varied significantly between treatments. Overall the feed was of poorer quality and quantity that at the conclusion of the first trial than the start of the second trial. Visual observations would suggest the lucerne had 'hardened' considerably and lacked the lush, high moisture content of the previous trial.

The highest quality and quantity feed in the three paddocks available was provided to the straw and barley treatment group, with the poorest feed to the control group. This difference had a major influence on the growth rates measured in the three treatments.

The less than ideal feeding conditions especially on the control and weaning pellet treatments resulted in lower lamb growth rates. The 300 gm/hd/day result on the barley and straw treatment can be largely attributed to the better feed on offer and to a lesser extent the additional energy provided by the barley.

Grazfeed underestimated the likely liveweight gains on all three treatments compared to what actually occurred. This makes interpreting the effect of the different treatments difficult, however it appear the influence of the weaning pellets was less once the feed had hardened.

A simple partial budget illustrates the costs and returns of using the weaning pellets (Table 11). The cost of the pellets was $1860 per tonne and the liveweight gain was valued at $3.50/kg carcass weight ($1.68/kg lwt). Vaccination with vitamin A,D,E cost 14c/hd and vitamin B12 15c/hd (excluding labour). No feeding out costs were included.

Table 11: Simple Partial Budget – Weaning Pellets

	Additional liveweight over trial period (kg/hd)	'Value' of this additional gain ($/hd)	Quantity of pellets fed[2] (kg/hd)	Cost of vaccination & pellets ($/hd)	Financial gain ($/hd)
Trial 1	1.6 kg	$2.69	1.12 kg	$2.37	$0.32
Trial 2	1.3 kg	$2.18	1.40 kg	$2.60	-$0.42
Trial 3	3.7 kg	$6.22	2.60 kg	$5.13	$1.09

[2] This varied in the first trial

This simple gross margin would suggest using pellets in trials 1 and 3 were marginally positive and this may improve if the effects could be sustained over a longer period of growth. However with pellets at a cost of $1860/tonne and fed at 100gm per head per day, a differential weight gain over the lucerne only treatment of 111 gm/day would achieve a break even result.

Photo 1: Simon Falkiner Inspecting Lambs