

EFFECT OF LOOSE LICK SUPPLEMENT ON THE GROWTH RATE OF LAMBS GRAZING ON LUCERNE

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Introduction

The real value of mineral supplements in sheep and lamb production systems has long been questioned. Provision of mineral blocks or a loose lick supplement is often provided as an insurance against any possible mineral deficiencies for either sheep grazing on stubbles or ewes during pregnancy and lactation. However McGrath et.al (2014) found no effect on Calcium and Magnesium blood levels across trials in ewes lambing on cereal crops deficient in these elements when a supplement was provided. No effect on lamb survival or birth weight was observed but lamb growth rates were fractionally higher in one of the trials where supplements were available. White et.al (1992) however found an increase in growth rate, clean fleece weight and staple strength with the use of a loose mineral lick involving Merino wether weaners. The use of a mineral supplement in feedlot finishing has arguably gained wider acceptance than grazing lambs on improved pastures. Apart from data generated by feed companies, there is limited information and still a question mark over the effectiveness of supplements in achieving higher growth rates.

Methods

188 White Suffolk cross lambs were drenched, inoculated, weighed and shorn prior to being divided into two equal size treatment groups and placed on actively growing dryland Lucerne pasture at Temora Agricultural Innovation Centre (TAIC). Within each group of lambs were three weight categories, Light Store (25-35Kg), Light Trade (36-45 Kg) and Trade (45-55Kg). One group was provided with a loose lick supplement (ad lib) and the weights of lambs and fat scores of all lambs regularly assessed.

The supplement provided was a commercially available product (Fabstock™ Feedlot Mix) with the following analysis as per the label:

- Salt 34%
- Molasses 2%
- Calcium 12 %
- Magnesium 1.6 %
- Sulphur 3.1%
- Phosphorus 1.2 %
- Potassium 0.25%

Contents: Salt, Agri-lime, Molasses, Vegetable Oil, Bi-Carb, Causemag, Di-Calcium Phosphate, Bypass Protein Meal, Magnesium Sulphate, Gypsum. **Trace Elements;** Cobalt, Iodine, Selenium, Methionine, Zinc, Manganese, Copper, Biotin, Chelated Zinc. Molybdenum **Vitamins;** Vitamin A, Vitamin B1, Vitamin D3 and Vitamin E

Regular pasture analysis was conducted as the trial continued and monitored to ensure adequate pasture quality was provided and stocking rate was not a limiting influence. At day 33, fresh Lucerne stands were provided to both groups. Recorded rainfall at Temora over the trial period was 21mm from 6 separate rainfall events, well below the seven year average of 90mm for February /March.

Due to lack of useful rain during the trial, no regeneration of the Lucerne was observed and moisture stress had an effect on feed quality.

To further evaluate the effect of providing a loose lick mineral supplement to the grazing lambs, a crossover of treatments was conducted at day 42 with 50% of the lambs from each weight category transferred to the alternative treatment category. After being weighed at day 42, lambs from each group and treatment were ranked on weight and every alternate lamb swapped to the alternative treatment to ensure no bias from lamb weights.

A full economic analysis was conducted on every aspect of the trial to investigate the range of management options available and opportunity costs of, not only the choice to use Lucerne as a finisher of lambs but, the possibilities of either selling lambs earlier or using a feedlot to finish the lambs.

Results

Growth Rates

Lambs provided with a loose lick supplement achieved higher growth rates across all weight categories as shown in Figure 1. The effect was greatest in the light trade lambs with a difference of 101 gms/day in growth rate between the two treatments. The trade and light store lambs were showing similar differences in growth until day 42 when the trade category in the Control (no supplement) group actually lost weight on Lucerne that had dropped most its leaf due to lack of moisture. This resulted in a growth advantage to the supplemented group on day 42 of 85 gms/day and 48 gms/day for the trade and light store lambs respectively.

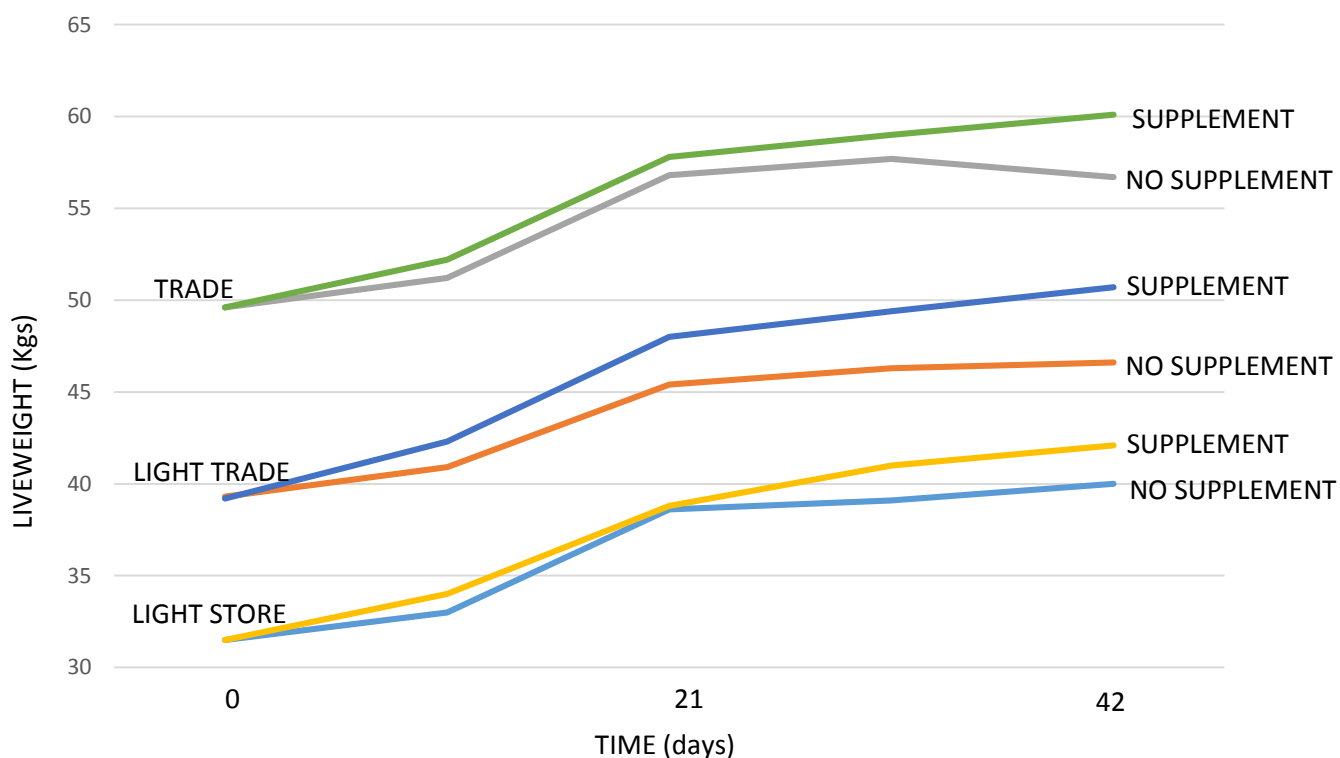


Figure 1. Effect of supplement on live weight gains across weight categories

The lambs on supplement appeared to settle faster after shearing/transporting and subsequently onto the Lucerne pasture and were noticeably less agitated at each weighing event. Despite a significant drop in the quality of the Lucerne stand (as evidenced in Figure 2.) supplemented lambs continued to gain weight across all weight categories. The data indicates that as the feed value decreased, the heavier the lambs were in the control group, the greater the effect on weight gain with the lighter lambs relatively less affected. The growth rates of the supplemented group were basically not adversely affected by further deterioration of the Lucerne stand once the leaf drop had commenced.

While both the protein and energy levels of the Lucerne dropped significantly over the duration of the trial, and protein levels did vary between the two treatment groups at day 33 and 42, the energy levels between the groups remained very similar. Work conducted by Ríos-Rincón et.al (2014) on finishing lambs found that the energy level of feed is the main driver of feed efficiencies and feed intake and increasing protein had no effect on weight gain. We therefore assume that the difference in protein levels of the Lucerne as the trial progressed, although higher in the control group, had minimal effect on the growth rate of the lambs which agrees with the findings of Beauchemin et.al (1995). The energy levels of the stands were relatively low but lambs still managed to achieve average growth rates across the 42 days in excess of 250 gms/day and at times during the trial, around 500 gms/day or better.

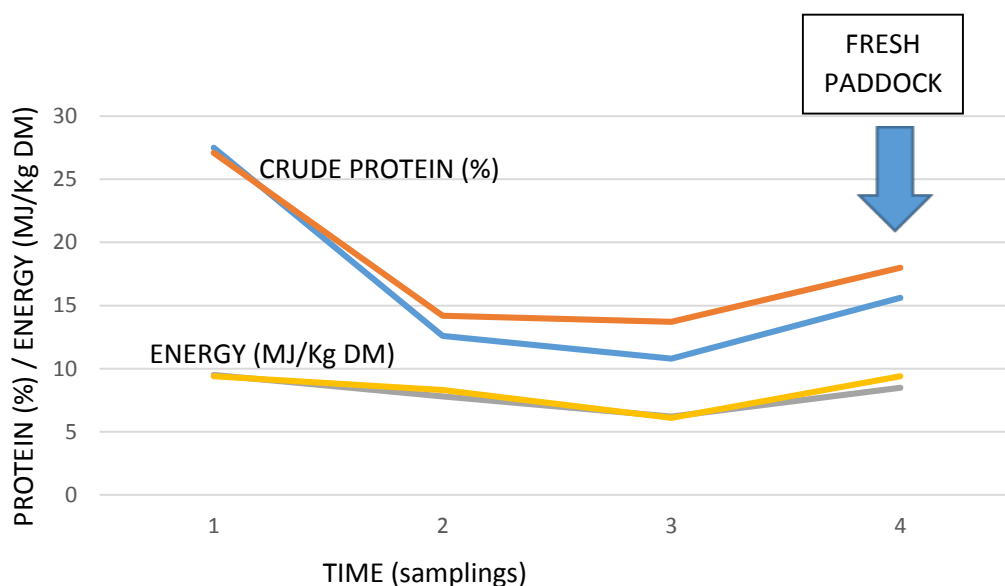


Figure 2. Changes in feed value of Lucerne stand over the period of the trial for the two treatments

At day 33 lambs were shifted to a fresher Lucerne stand and at day 42, half the lambs from each group were transferred to the alternative treatment. When compared to the lambs that had been on the supplement for the duration of the trial, those lambs that went to the control after being on supplement showed a significantly lower weight gain while those that had previously been without supplement revealed a weight gain equal to, if not slightly better than, the lambs on supplement for the duration of the trial. The results from this can be seen in Figure 3.

The increase in weight gain from the lambs that were previously not on supplement was greatest in the trade and light trade lambs and not significantly different when compared to the reverse

treatment in the lighter lambs. As these weights were attained just 10 days after the change of treatment, it confirms the positive effect of the supplement on the growth of lambs on Lucerne pasture. Continued weight measurements for another 3 weeks validated that the lambs on supplement continued to grow on average at faster rates than those without supplement (155gms/day compared to 103gms/day respectively) even on a depleted Lucerne stand.

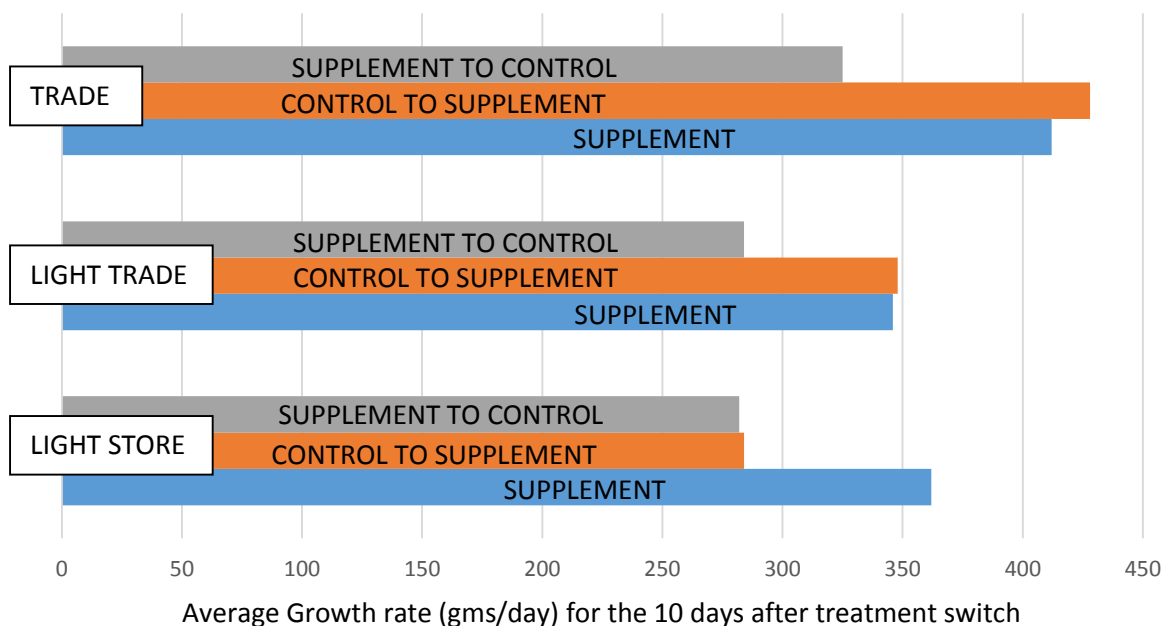


Figure 3. Effect of changing treatments on weight gain

Supplement consumption

The intake rates of the supplement were monitored for the duration of the trial. After an initial adjustment period where intake was 102 gms/hd over the 1st week, levels were initially high at 410gms/hd over the 2nd week, 205gms/hd for the 3rd week and settling on an average of 153 gms/hd/ week \pm 25gms for the remainder of the trial. Intake did not increase as feed value of the Lucerne decreased.

Fat Score

As with growth rates, fat score evaluations were higher in the lambs on supplement than those not on supplement. Supplemented lambs finished the trial with an average of 2 mm more fat (10.4 v's 8.4) across all weight categories which was an increase of almost a full fat score (5mm) from the initial evaluations. The increase in fat score was more evident in the heavy trade lambs and this was consistent across both treatments.

Financial analysis

The Lucerne pasture was at an ideal stage and condition allowing for the option of cutting and baling for hay production. The decision to finish lambs on this pasture rather than sell them as stores or light trade lambs was evaluated along with the alternate possibility of placing the lambs into a feedlot and finishing to the weights achieved on Lucerne.

Options

Lucerne Hay (Assumptions; 18% moisture, 30% wastage v's pasture cuts) Sold in the paddock
41ha Lucerne pasture @ 0.824t/ha = 33.78 tonnes - grade A1 (AFIA) @ \$400/t = \$13,514
Less Cutting/Conditioning @ \$65/ha = \$2665
Raking and Baling @ \$30/tonne = \$1013
\$3678 Total profit = \$13,514 - \$3,678 = **\$9,836**

Sell lambs without Finishing (MLA Wagga Sheep Report Prime Sales (15/1/2015 Wagga))
Light Store 50 @ 30.85 Kg @ \$5.20/Kg dw (@ 47% Dressing %) 14.5 x 5.20 x 50 = \$3,770
Light Trade 73 @ 39.23 Kg @ \$5.50/Kg dw (@ 47% Dressing %) 18.4 x 5.50 x 73 = \$7,388
Trade 65 @ 49.31 Kg @ \$5.08/Kg dw (@ 47% Dressing %) 23.2 x 5.08 x 65 = \$7,660
188 \$18,818
Less Transport (\$385.40) Commission (\$940.90) Yard Fees (\$65.80) Levy (\$282) \$ 1,674
\$17,144

Feedlot Lambs (Determined using Feedlot Calculator)

www.dpi.nsw.gov.au/data/assets/file/0005/181499/feedcalculatorv3.xls

Light Store 50 @ 30.85 Kg grown to 40.04 Kg (28 lambs) and 40.89 Kg (22 lambs) **\$3.99 LOSS**
Light Trade 73 @ 39.23 Kg grown to 46.62 Kg (33 lambs) and 50.72 Kg (40 lambs) **\$14.95 LOSS**
Trade 65 @ 49.31 Kg grown to 56.70 Kg (36 lambs) and 59.42 Kg (29 lambs) **\$7.38 LOSS**

Sell lambs after finishing on Lucerne (MLA Wagga Sheep Report Prime Sales (5/3/2015 Wagga))

Light Store 50 @ 30.85 Kg grown to 40.04 Kg (28 lambs) and 40.89 Kg (22 lambs)

Control 28 @ 40.04 Kg @ \$5.25/Kg dw (@ 47% Dressing %) 18.8 x 5.25 x 28 = \$ 2,766
Supplement 22 @ 40.89 Kg @ \$5.25/Kg dw (@ 47% Dressing %) 19.2 x 5.25 x 22 = \$ 2,218

Light Trade 73 @ 39.23 Kg grown to 46.62 Kg (33 lambs) and 50.72 Kg (40 lambs)

Control 33 @ 46.62 Kg @ \$5.00/Kg dw @ (47% Dressing %) 21.91 x 5.00 x 33 = \$3,615
Supplement 40 @ 50.72 Kg @ \$5.20/Kg dw @ (47% Dressing %) 23.84 x 5.20 x 40 = \$4,959

Trade 65 @ 49.31 Kg grown to 56.70 Kg (36 lambs) and 59.42 Kg (29 lambs)

Control 36 @ 56.70 Kg @ \$5.30/Kg dw (@ 47% Dressing %) 26.65 x 5.30 x 36 = \$ 5,085
Supplement 29 @ 59.42 Kg @ \$5.45/Kg dw (@ 47% Dressing %) 27.93 x 5.45 x 29 = \$ 4,414
\$23,057

Less Transport (\$385.40) Commission (\$1,153) Yard Fees (\$65.80) Levy (\$282) \$ 1,886
110Kg Supplement @ \$1.30/Kg \$ 143
\$ 21,028

Analysis of the benefits of using a Supplement

As the lambs with access to the supplement achieved higher growth rates and were on average half a fat score better, this elevated them into a higher price bracket at sale time for both the trade and light trade groups (now classified as heavy trade and light export).

An analysis (Table 1.) of the cost-effectiveness of using a supplement was undertaken with the assumption that the lighter lambs theoretically consumed less of the supplement than the larger lambs with a ratio of 0.25, 0.35, and 0.40 used across the Light Store, Light Trade and Trade categories respectively.

The supplement is purchased in 25Kg bags @ \$32.45 per bag, equivalent to \$1.30/Kg

Table 1. The economics of using supplements when finishing lambs on Lucerne

| | | Sale \$/head | Cost Supplement | Margin | Gain |
|--------------------|-------------------|--------------|-----------------|----------|----------------|
| LIGHT STORE | CONTROL | \$98.78 | | \$98.78 | |
| | SUPPLEMENT | \$100.82 | \$1.42/head | \$99.40 | \$0.62 |
| LIGHT TRADE | CONTROL | \$109.55 | | \$109.55 | |
| | SUPPLEMENT | \$123.98 | \$1.57/head | \$122.41 | \$12.86 |
| TRADE | CONTROL | \$141.25 | | \$141.25 | |
| | SUPPLEMENT | \$152.21 | \$1.65/head | \$150.56 | \$9.31 |

In all weight categories, real dollar gains were achieved by the use of a supplement. The greatest gains were in the Light Trade category with an average gain across all lambs in the trial of \$8.77 per lamb.

Discussion

The results of this trial clearly indicated an economic benefit across all weight categories associated with the use of a supplement. The gains were significant with average growth rates per day increasing above the growth rates of the control groups by an average of 48 gms/day, 101 gms/day and 85 gms/day in the Light Store, Light Trade and Trade lambs respectively. This represented an increase in weight gain per day of 23%, 58% and 51% respectively across the weight categories when compared to the un-supplemented lambs for the 42 days of the trial. This advantage in growth rate per day resulted in an increase in the profitability of the lambs of up to \$12.86/head or an additional 11.7% value in the Light Trade category and even in the Light Store category where weight gain was the least significant, a small advantage was gained with the use of supplement.

The Lucerne received minimal significant rainfall after the commencement of the trial and no Lucerne regrowth was observed. Despite this drop in feed quality, acceptable growth rates were still achieved from the lambs on supplement whereas at times, lambs without supplement actually remained static or lost weight. At no stage did the average weights of the lambs on supplement approach a situation where they stopped growing. The larger lambs seemed more prone to slow their growth rate when feed quality and quantity dropped more than likely due to higher requirements for maintenance energy. Obviously the decision to use Lucerne as a finisher for lambs is more unreliable than the use of a feedlot to provide constant feed quality and quantity but when

available, is a suitable choice to achieve good growth rates. The reality that at times during the trial, lambs achieved average growth rates around 500 gms per day in the heavier category indicates that Lucerne pasture (when available) may be even more suitable than a feedlot. No deaths or shy feeders (poor performers) were identified and all lambs grew relatively even as a group. The management required to finish the lambs on Lucerne is significantly different to that required in a feedlot operation.

When we look at the respective roles of the vitamins and minerals available in the supplement we can surmise, with relative safety, that the improved performance within supplemented lamb treatments was due principally to the benefits of:

- **Vitamin B12.** Vitamin B12 production and availability is closely related to Cobalt intake and stage of rumen development. B12 has a role in the production of glucose, a major energy form used by the lamb.
- **Magnesium.** Magnesium has a role as an 'enzyme cofactor' and is involved in the metabolism (breakdown) of carbohydrates, lipids & protein and in nerve conduction and muscle contraction. High intakes of Potassium (K), Calcium (Ca), Phosphorus (P) and Nitrogen (N) decrease Mg availability. Lucerne generally contains high levels of K and N and it is likely that Mg absorption may have been impaired while grazing these pastures. Provision of additional Mg would therefore assist with energy production and 'calming' of lambs (refer below).
- **Sodium.** Sodium has a role in maintaining salt levels in body fluids, maintaining the acid/base and water balance and in nerve transmission. Inadequate sodium may be responsible for dehydration and poor growth rates. High intakes of sodium (Na) however can increase the availability of Mg availability

It is unlikely, based on daily intake levels of the supplement, that additional energy (molasses, vegetable oil) and protein (bypass protein meal) provided by the supplement would have had all but a minor impact on performance. Improvements in palatability of the supplement from these components is likely to be their greatest benefit.

The issue of temperament is one that that was quickly identifiable as a difference between the two treatments. The lambs on supplement were noticeably less flighty and easier to handle both in the paddock and through the weighing crate. The supplement contained 1.6% Magnesium, an element well known to be effective in reducing stress levels across many species including horses and cattle. Deficiency symptoms in lambs may lead to excitability, convulsions, tetany and death in extreme cases. Gardner et.al (2001) also found Magnesium supplement effective in reducing stress levels in lambs prior to slaughter. The relatively high levels of K and N (crude protein) in Lucerne may therefore reduce the efficiency of with Mg absorption, most of which occurs within the rumen (www.organicvet.co.uk), limiting an essential element for energy reactions and nerve function. There is little doubt that stress affects weight gain and findings (Geoff Duddy, unpublished) indicate that even the practice of regular weighing of lambs can limit weight gain for 1-2 days after each weighing event. While additional research is needed in terms of the role of Mg in stress reduction and improving productivity, it appears cost beneficial to provide supplemental Mg based on these trial findings.

The decision concerning which opportunity to employ when finishing lambs following the purchase of store lambs or value adding lambs raised on property is one that requires good economic evaluation. Recent years have seen the relationship between the prices of store lambs compared to trade lambs at an unfavourable ratio, often with store lambs at a dearer price per kilogram. Every advantage is required to ensure that, when finishing lambs, the growth rate you achieve is one that

will deliver maximum profitability. The faster the desired weight gains, the better the chance of being on the right side of the ledger. Based on the results of this trial, the use of a supplement is one way to achieve those desired gains within a shorter time frame when finishing on Lucerne. The calculation of the expected returns in a feedlot scenario did not return a profit in any of the lamb weight categories when all costs (real and opportunity) were taken into consideration.

The response to the change in treatment at day 42 was a clear indication of the effectiveness of the supplement in facilitating higher growth rates. Having already observed faster daily growth rates in supplemented lambs, the fast response to the supplement from previously un-supplemented lambs that was equal to if not higher than their contemporaries was clear evidence of the effect of the supplement. The fact that the lambs taken off supplement dropped their growth rate so quickly is confirmation that the provision of supplement needs to be constant and continuous to achieve maximum growth rates. The initial consumption rates of supplements often panics producers but we found a quick return to moderately consistent intake levels of around 150 gms/head/week or \$0.20 /head/week. The return in additional income from accelerated weight gain due to the supplement was on average \$1.46/head/week over the 42 days of the trial or an average 600% return on the cost of the supplement.

We conclude the effect of supplements when grazing Lucerne pasture has a significant positive effect on weight gain across a range of weight categories in lambs. The economics of using supplements was shown to be a significantly positive one however, the decision as whether to finish lambs or sell earlier as stores, always needs to be one that is fully investigated to evaluate whether justifiable gains can be realised.

References

K. A. Beauchemin, L. A. McClelland, G. C. Kozub, S. D. M. Jones (1995) "Effects of crude protein content, protein degradability and energy concentration of the diet on growth and carcass characteristics of market lambs fed high concentrate diets" *Canadian Journal of Animal Science*, 1995, 75(3): 387-395

G. E. Gardner, R. H. Jacob and D. W. Pethick (2001) "The effect of magnesium oxide supplementation on muscle glycogen metabolism before and after exercise and at slaughter in sheep" *Australian Journal of Agricultural Research* 52(7) 723 – 729

S. R. McGrath A E F, M. S. Bhanugopan A E, H. Dove B, E. H. Clayton C E, J. M. Virgona D E and M. A. Friend A E (2014) "Mineral supplementation of lambing ewes grazing dual-purpose wheat" *Animal Production Science* 55(4) 526-534

F. G. Ríos-Rincón, A. Estrada-Angulo, A. Plascencia, M. A. López-Soto, B. I. Castro-Pérez, J. J. Portillo-Loera, J. C. Robles-Estrada, J. F. Calderón-Cortés, and H. Dávila-Ramos (2014) "Influence of Protein and Energy Level in Finishing Diets for Feedlot Hair Lambs: Growth Performance, Dietary Energetics and Carcass Characteristics" *Asian-Australas J Anim Sci*. 2014 Jan; 27(1): 55–61.

CL White, DG Masters, DW Peter, DB Purser, SP Roe and MJ Barnes (1992) "A multi element supplement for grazing sheep. I. Intake, mineral status and production responses" *Australian Journal of Agricultural Research* 43(4) 795 – 808

www.organicvet.co.uk/Sheepweb/disease/magweb/magnes1.htm

www.dpi.nsw.gov.au/_data/assets/file/0005/181499/feedcalculatorv3.xls