

The role of silage in lamb-finishing systems

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Summary

Silage can be stored as a long-term forage that is suitable for many feeding situations in a sheep production enterprise. Good quality, highly digestible legume silage when fed alone to second-cross lambs in feedlots will give liveweight (LWT) gains of up to 150 g/head/day (g/h/d). This can double when silage is replaced by 70% grain. Silage form (bales or forage-harvested) and chop (particle) length will only play a minor role in changing LWT gain. Silage and grain can be fed every second day; however, it is necessary to provide sufficient access so that 25% of the lambs can feed at any one time. When grain is fed separately, lambs require 15 to 20 cm/head of trough space, or one 2.4-m, two-sided feeder per 200 lambs. Silage has no adverse effects on meat quality. The ration selected by producers will depend on production goals, relative cost of ration components, and market delivery expectations.

Introduction

Silage can be successfully fed to sheep to improve animal performance, pasture utilisation, and management by transferring surplus feed to less favourable periods of feed supply.

The potential roles for silage in sheep enterprises are:

- Finishing prime lambs.
- Supplementation of ewes throughout the breeding cycle: need for high-quality forage in peak production periods.
- Supplementation of weaners to prevent nutritional stress during periods of low-pasture quality and availability.
- Weaner management training for full feeding, to reduce grass-seed contamination, and to provide clean regrowth for parasite control.
- Finishing cull sheep.
- Drought feeding and production for all classes.
- Organic farming: a source of certified forage.

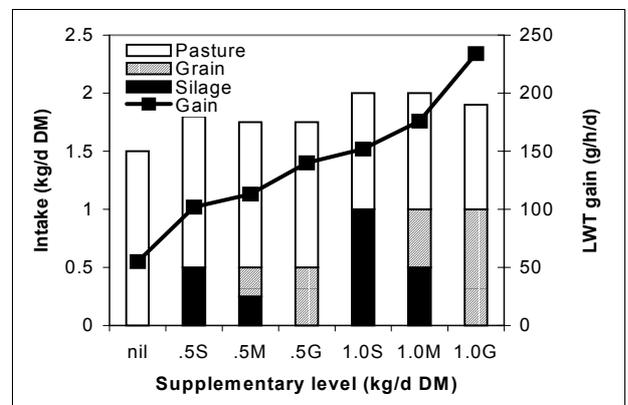
Good-quality silage correctly stored maintains its quality and is price stable in times of drought and grain shortage. It can be traded, especially square bales, but is less flexible than hay or grain as a saleable commodity. It is important that producers clearly understand the critical nutritional needs of the animal, feeding management, and economics associated with silage production before integrating it into their production system. In all cases, a focus on silage quality is important, as this determines the potential animal production per tonne of silage dry matter (DM).

Feeding of sheep

Supplementation of weaned lambs for meat production

Consumers of lamb have expectations of a consistent, high-quality product being available throughout the year. New market demands for heavier carcasses carry additional risk since lambs must be held for 2 to 3 months longer. Furthermore, in many areas of southern Australia, weaned carry-over lambs struggle to maintain weight over the dry summer. In both cases, silage has been used to improve lamb growth and cash flow by adding value to the lambs.

Supplementation aims to correct the most limiting component (energy and/or protein) of the diet, and silage can be considered primarily a source of energy. With the addition of selected grains or quality pasture, the ration fulfils the requirement of 15% crude protein (CP) with a metabolisable energy (ME) of 9 MJ/kg DM. Figure 1 provides some interesting comparisons for predicted responses for intake and growth rate per day. (The input details for Figure 1 are given in Table 1.)



Adapted from Stanley *et al.* (2000a).

Figure 1. Intake and growth rates predicted by GrazFeed for two levels of supplementation (0.5 and 1.0 kg DM/day) for three rations: silage (S); 50:50 silage:grain (M); grain (G).

Silage quality is important. For example a decrease in silage ME from 10 to 8.5 MJ/kg DM for a 50:50 ration mix, feeding 1 kg/DM per day, would result in a predicted reduction in LWT gain from 176 to 155 g/h/d. Feeding a higher proportion of grain (i.e., 60%) would maintain growth rate.

Silage can also be used to extend the grazing life of green pasture or increase stocking rates. Holst (unpublished data) reported that, by feeding 390 g/h/d DM of lucerne

Table 1. Input details for Figure 1.

| Input | Detail |
|---------------------------------|--|
| Pasture | Green pasture: 600 kg/ha, 65% digestibility; dead pasture: 2,000 kg/ha, 44% digestibility. |
| Metabolisable energy (MJ/kg DM) | Oats: 11.4; Lupins: 12.4; Silage: 10.0. |
| Oven dry matter (ODM%) | Oats: 90; Lupins: 92; Silage: 40. |
| Grain | 80% oats and 20% lupins. |
| Stock | First-cross, 4- to 5-month-old wethers, 40 kg liveweight. |

Notes:

- Dry summer pastures are low in protein; hence, weaners will require a protein supplement.
- While the pasture has a green component, selective grazing could mean protein supplements may not be required.
- During drought conditions, lambs will need to be fed roughage plus a high-protein concentrate, especially if they have been weaned at light weights.
- Producers should consult drought feeding guidelines for further details on managing weaners in drought conditions or consider providing a complete diet in a feedlot.

silage, lucerne pasture intake was reduced by 15% and income was increased by \$66/ha. It may be necessary to offer the silage or supplementary feed in a small paddock prior to grazing if it is being rejected in favour of the fresh pasture.

Supplementation of weaned lambs for wool production or breeding replacements

The most important objective for weaner sheep being retained as breeding replacements is to achieve a critical minimum mating weight of 40 kg for Merinos (Table 2) and 45 kg for crossbreeds.

Table 2. Examples of target weights for Merino weaners being retained as breeding replacements.

| Factor | Growth target of 160 g/h/d | | Growth target of 50 g/h/d | |
|----------------|----------------------------|---------|---------------------------|---------------------|
| | Birth | Weaning | 6 months | Joining (19 months) |
| Desired weight | 3 kg | 18 kg | 23 kg | 40 kg |

A 25-kg weaner requires 14% protein in a diet of 12 MJ/kg DM to grow at 50 g/h/d. Supplement can provide growth rates of 50 g/h/d in young weaners by feeding:

- 100 g/h/d (DM) of high-quality silage if some green herbage is available.
- 650 g/h/d (DM) of high-quality silage if only low-quality, dead pasture is present.

The addition of lupins (25% DM basis) will reduce total supplement requirement by 20%.

Factors affecting the performance of lambs with silage rations

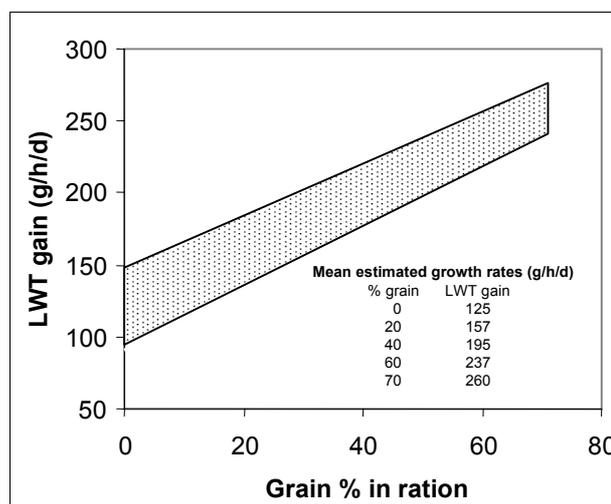
Concentrates

Cereals and protein supplements like canola meal (Yilala and Bryant, 1985) or lupins (Graham, 1997) improve ME intake and nitrogen (N) retention. This is because the fermentable carbohydrate from the grain improves the utilisation of the rapidly degraded nitrogen that is released shortly after silage is digested. Grain therefore improves feed efficiency; but high amounts of cereals, especially if processed, can reduce rumen pH to unsatisfactorily low levels, causing acidosis or grain poisoning.

Normally, silage is substituted for grain, so the total daily intake may only increase slightly. On average, a daily intake of 3.5% of LWT was achieved with lucerne silage at Cowra Research Station (CARAS) (Stanley, 2002).

Various forms of lucerne-based silage were used in three experiments at CARAS in 1998 with 900 second-cross wether lambs, averaging 35 kg LWT at the start of each trial. The range of LWT gain that was achieved is illustrated by Figure 2. Results are similar to those achieved by Graham (1997) and Mulholland and Scott (1992) for *ad libitum* feeding. Grain used was a mixture of lupins:barley in the ratio of 25%:75% (average). During the introductory period of 2 weeks, little LWT gain was achieved.

Lamb growth rates on legume silages with over 50% concentrates have been variable, but it would be expected that LWT gain with 60% to 70% concentrates would be at least double that of silage alone. Extra concentrates can compensate for silages of lower ME.



Source: Stanley *et al.* (2002b).

Figure 2. Expected range of growth rates using lucerne silage at various grain levels.

Silage quality

Many factors affect silage quality and, consequently, animal performance. Some things to keep in mind are parent material and time of harvest, fermentation, wilting and additives, and weeds.

Parent material and time of harvest. Silages from legume-dominated pastures (Fraser *et al.*, 2002) will provide better intakes and production than silages from grass or cereal crops. Delaying time of harvest will increase yield but reduce quality. For sheep, it has been reported that, for each 1% decrease in digestibility of ryegrass silage, intake will be reduced by 50 g/h/d (Fitzgerald, 1987); and maximum gain per/ha will occur when silage is cut at ear emergence. Whole-crop barley silage provided a different scenario because the filling of the grain kernel compensated for energy lost through the maturing of the stem and leaf. Best lamb growth rates occurred when the crop was harvested at the milk or early dough stage (Borowiec *et al.*, 1998). Maize and grain sorghum silages also retain their digestibility because of the increasing energy value of the ear and grain and will generally give better results than forage sorghum

Fermentation. Oats silage at 30% DM that was poorly fermented but with good ME and protein levels (Holst *et al.*, 1999) provided only maintenance when fed alone and growth rates of 144 g/h/d when fed *ad libitum* with 46% grain. The lower results are primarily due to reduced daily intakes of 2.6% LWT.

Wilting and additives. Wilting will normally be carried out in Australia because of favourable drying conditions leading to reduced effluent, bales retaining their shape, improved silage fermentation, and often improved animal performance (Gudmundsson and Thorteinsson, 1999). Wilted crops will be more economical to produce and feed out because less water is being handled. There is only limited information on the role of bacterial additives and sheep performance, and further research is needed.

Weeds. Contamination with such weeds as barley grass will reduce performance through lower intake. This is illustrated in Table 3.

Table 3. Influence of barley-grass-infested lucerne silage on intake and LWT gain.

| Parameter | Unchopped | Chopped pre-ensiling | Chopped post-ensiling |
|----------------------------|-----------|----------------------|-----------------------|
| Avg. particle length (cm) | 42 | 9 | 1.5 |
| Intake LWT % | 3.5 | 2.8 | 3.2 |
| Seed heads (% DM silage) | 1.8 | 4.8 | 1.8 |
| Seed heads (% DM refusals) | 3.1 | 9.6 | 2.6 |
| LWT gain (g/h/d) | 176 | 133 | 145 |

Source: Stanley (2002).

Chop length and silage form

With unwilted ryegrass silages of less than 25% DM, better results have been achieved with short-chopped silages, with the best particle length being 1.8 to 7.0 cm. Fitzgerald (1996) states that, for each 1 cm reduction in particle length, LWT gain increases by 14 g/h/d, intake increases by 56 g/h/d (DM), and rumen retention time decreases by 1.5 hours.

Research at CARAS compared various forms of bales (square, round), chopped pre- and post-ensiling, and precision-chop lucerne and oats silages at various grain levels. The overall conclusion is that, when access is not restricted, animal production from long chop-length systems will play a minor role in reducing LWT gain by 10 to 20 g/h/d (Stanley, 2002; Holst, unpublished data). While similar results were obtained with lucerne and oats silage, there is a need to further investigate fine, short-stemmed species, such as sub clover and other pasture silages. Our recommendation is to concentrate on economic and management factors when picking a silage system.

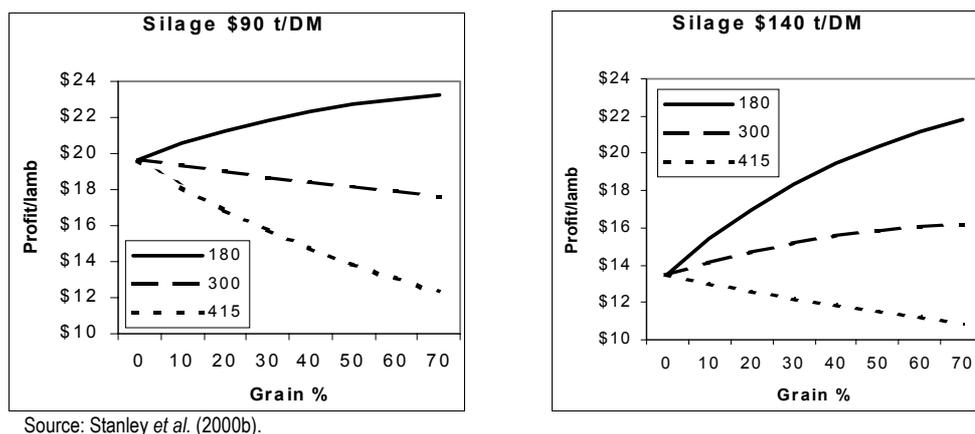
Feeding frequency, access, and animal behaviour

With unrestricted *ad libitum* access to silage feeding, frequency is not important. Most experiments have compared feeding at least daily; however, it is possible to feed silage and grain every second day and maintain normal daily DM intakes of 3.5% to 4.0% LWT (Stanley, 2002). Silage in all forms will last at least 2 days (Stanley and Holst, 2000) and in dense bales will last much longer than that. It is important to provide access for 25% of the sheep to feed at any one time, and this is not related to grain level or chop length (Stanley, 2002). Whole, round bales should be fed in a feeder at 1 bale per 60 to 70 lambs, providing about 50% of daily intake and lasting for 3 days. Square bales can be broken into biscuits to provide better access. Restricting time to feed (a few hours per day) will result in lower intakes. Lambs need adequate trough space for grain of 15 to 20 cm/head, or a 2.4-m self-feeder per 200 lambs when access is to both sides (Holst, pers. com.).

There is some evidence from research at Cowra that feeding silage and grain separately will be more efficient (Stanley, 2002). The use of grain self-feeders and feeding of silage separately will provide a lower-capital-cost alternative to mixing wagons.

Carcass fatness and quality

Lambs fed higher-grain rations had slightly fatter carcasses at the GR site (half a fat score) in some trials; and for others, fatness was not affected with increasing grain levels. There are no adverse meat-quality issues caused by feeding lambs high-silage rations.



Source: Stanley *et al.* (2000b).

Figure 3. Profit from feeding lambs at different proportions of grain at several grain and silage prices (grain prices are in the box in each graph).

Factors affecting the profitability of finishing lambs with silage

The profit per lamb will be determined by:

- *Animal factors*: the size of the lamb and its growth rate (breed, sex, genetics); starting and finishing values (\$/kg) and variable costs.
- *Feed factors*: losses, quality, silage and grain costs, machinery feedout costs.
- *Labour feedout cost*: e.g., represent as cents/lamb/day.

Figure 3 illustrates a typical range of intakes and profits for a prime lamb enterprise.

Conclusion

Silage can play a useful role in providing a stable feed source for finishing lambs in supplementary or feedlot situations. Growth rate can be increased by the addition of grain, depending on the relative costs of ration components and market delivery expectations.

Normal daily intakes are achieved when the silage is well-fermented and free of weed contamination. Good LWT gains are achievable with long forms of legume silage if it is highly digestible and fed with adequate access.

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Personal communications

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