Unpublished Report

Document ID:	SheepCRC_8_12
Title:	Grain Feeding Systems for Lamb Production
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Key words:	sheep; lamb; feedlot; performance; monitoring; weighing

PROJECT 1.5.1 – GRAIN FEEDING SYSTEMS FOR LAMB PRODUCTION

Milestone 22 – Liveweight gain variability in feedlots

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Background

Anderton (2005) concluded that feedlot returns are governed by time in the feedlot (includes initial weight of an animal on entering the feedlot and the growth rate of the animal) and price of feed. The difference in price between store sheep and finished lambs is also important. Anderton provided detail on the expected returns from a group of feedlot finished lambs but did not provide detail on the variation in performance of individual lambs within a feedlot. Radio frequency identification (RFID) technology provides the opportunity to monitor individual performance. The ability to track individual performance provides a number of opportunities including the identification of poor performers or shy feeders, as well as high growth rate individuals. Management may then be able to be modified to target these lambs and improve the group return.

The aims of this trial were to:

- investigate the variability in lamb performance in feedlots and,
- investigate the use of RFID in monitoring individual lamb performance in a feedlot.

Description

A trial was undertaken in a single pen feedlot, with a maximum capacity of 500 lambs, at Narrogin, Western Australia. Three groups of lambs, organised by the collaborating producer were monitored. The target market for these lambs was Q lamb, which has a specification of 17-24 kg carcase weight and 6 -15 mm tissue depth. All lambs were tagged with radio frequency identification (RFID) tags on entry to the feedlot. Macco 707 pellets were provided in two round self feeders.

Lambs were body weighed on a weekly basis through a Prattley autodrafter. A 'Walk Over Weigher' (WOW) system was installed into the feedlot which divided the pen into two sections, separating the feed from the water and shade. The WOW system requires a lamb to walk over a scale platform to access the feed, and then return through a set of one way spears to return to the water. The system aims to record a bodyweight and RFID each time a lamb passes over the platform.

Group 1 consisted of 174 Merino and crossbred mixed sex lambs purchased directly off farm from two local farms in September 2006. Group 2 consisted of 184 cross bred mixed sex lambs, originating from 4 different sources and purchased through the Midland saleyards. These lambs were placed in the feedlot in January 2007. Group 3 consisted of 262 Merino/Samm Merino cross wethers bred on the property and they entered the feedlot in February 2007.

Variability in performance was considered from a growth rate in grams/head/day (g/hd/d) and a net return ($/head) perspective. Costs incurred were recorded. The cost of feed was calculated using the assumption that lambs consumed 3.5% of average liveweight [i.e. feed cost = average liveweight x 0.035 x feed cost/tonne x days in feedlot]. Net return was determined from gross income [hot carcase weight x sale price ($/kg)) + skin value] minus variable costs.

Variable costs included: purchase price (or store price value); feed cost ($330/tonne); levies (2% gross value + Q lamb levy); freight ($1.95/lamb); drench/vaccination/Vitamin E ($0.71/lamb); NLIS tag ($0.12/lamb) + labour ($0.05/hd x days in).

Results

Growth and net return data are provided for each of the groups of lambs in Table 1 to 3 and Graphs 1 to 4.

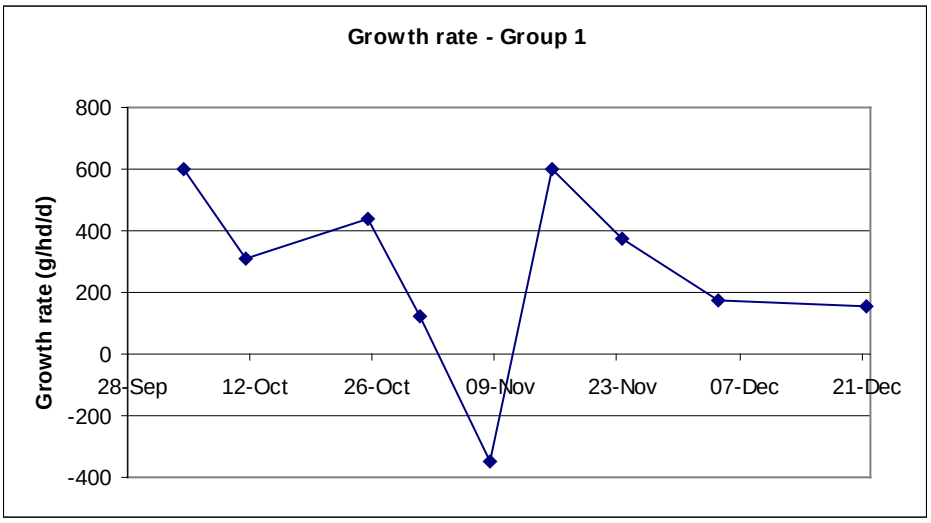
Table 1: Production data and estimated net return of different groups of lambs finished to Q-lamb specifications in a commercial feedlot.

Group	Purchase $/kg LW	WT in kg	WT out kg	Days in	Growth rate g/hd/d	Fat depth mm	Carcase weight kg	Net return $/hd
1	0.90	34.4	45.4	32	418	-	20.0	9.55
2	**1.18**	**38.4**	**50.5**	**28**	**450**	**8.9**	**21.1**	**2.35**
2a	1.16	39.8	51.2	22	560	8.5	21.9	5.06
2b	1.18	37.1	51.2	32	464	8.6	20.9	2.84
2c	1.17	40.5	50.6	28	388	8.6	20.9	0.03
2d	1.23	34.6	48.8	41	402	9.2	20.5	-0.69
3	1.00	42.2	48.5	30	220	9.8	21.3	4.45

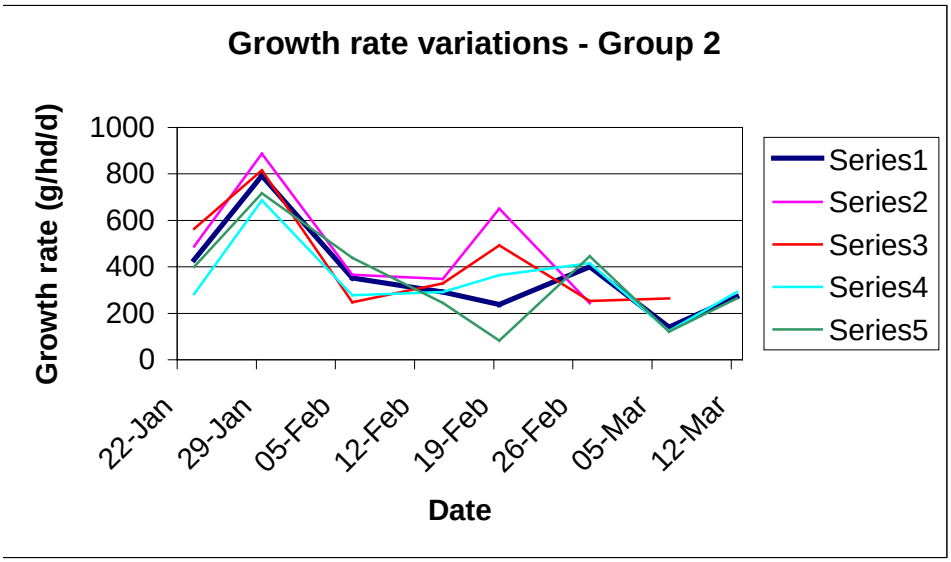
Table 2: Growth rate for the period within the feedlot

Group	Average Growth rate g/hd/d	Minimum Growth rate	Maximum Growth rate
1	418	-164	1182
2	**450**		
2a	560	180	900
2b	464	279	687
2c	388	121	615
2d	402	186	795
3	220	-5	587

Graph 1. Average growth rate for the feedlot period for Group 1.



Graph 2. Variation in average growth rates between lines in Group 2.



Graph 3. Growth rates for 7 individual lambs from Group 3.

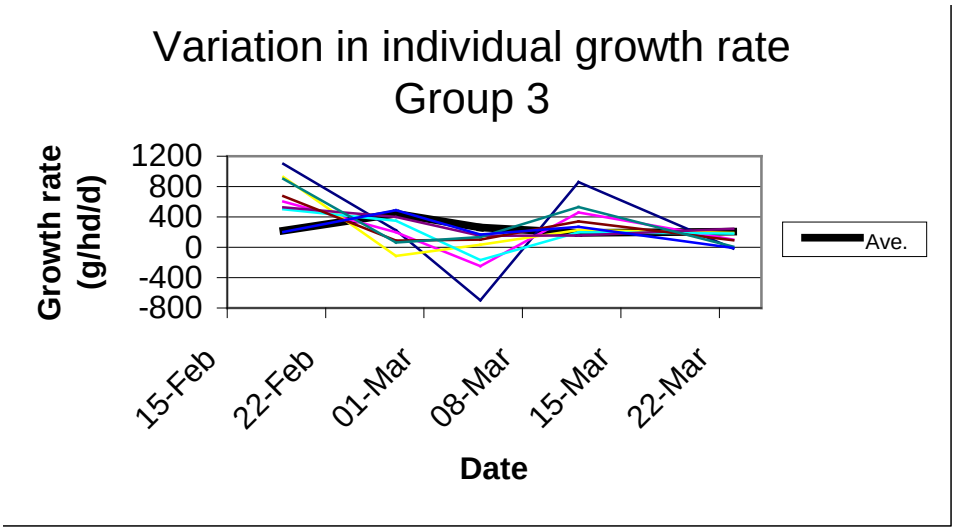
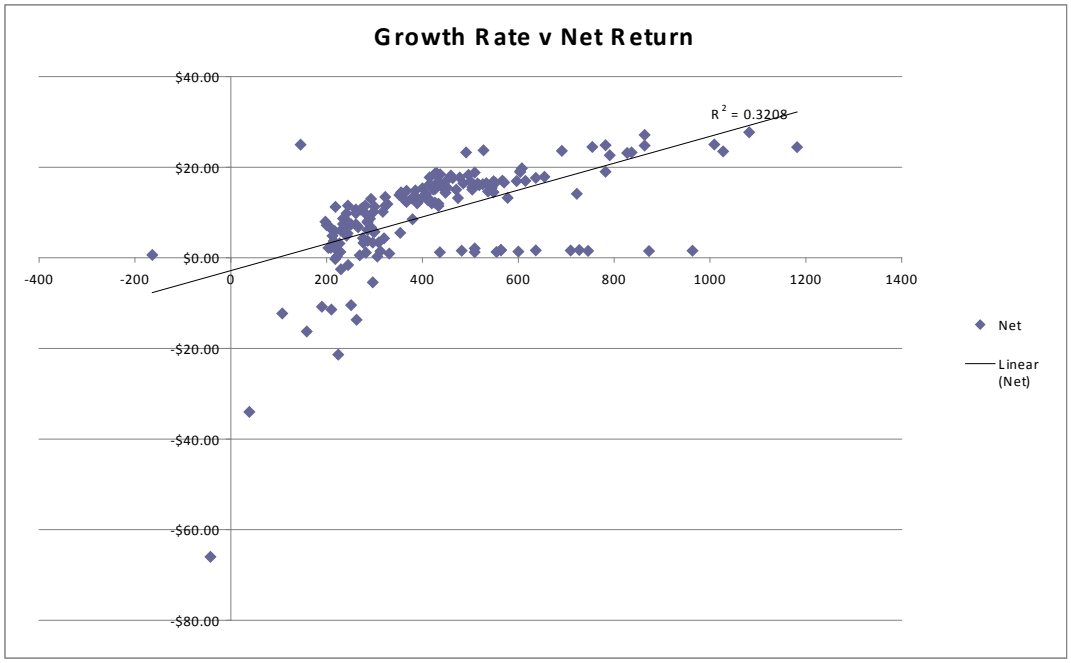


Table 3: Variation in net return for the period within the feedlot

Group	Ave. net return $/hd	Min. net return $/hd	Max. net return $/hd	% negative return	Ave. days in	Ave. growth rate
					Lambs with negative return	
1	9.55	-65.99	27.72	8	60	184
2	**2.35**					
2a	5.06	-21.62	13.61	11.6	30	483
2b	2.84	-20.69	9.94	24.0	47	358
2c	0.03	-28.63	12.26	33.3	40	315
2d	-0.69	-21.45	9.69	39.5	54	317
3	4.45	-45.58	14.52	21	39	197

Graph 4. Net return by growth rate for Group 1.



Discussion

Growth Rate

Growth rate varied significantly between and within groups. The largest within group variation occurred in Group 1 with a growth rate ranging from -164 g/hd/d to 1182 g/hd/d for individual lambs. Whilst average growth rate for the group was 418 g/hd/d for the total period within the feedlot, weekly growth rates ranged from a loss of 348 g/hd/d up to 602 g/hd/d increase (see Graph 1). The loss in growth rates for the early November period was the result of a significant increase in the average daily temperature for a 4-5 day period.

Group 2 consisted of four different sources of lambs with average growth rates between lines varying from 388 g/hd/d (Group 2c) to 560 g/hd/d (Group 2a) (see Table 1). Genetic differences could be an influencing factor causing this difference. Average growth rate for the entire group was 450 g/hd/d. The variation ranged from 121 to 900 g/hd/d for the period in the feedlot (see Table 2).

The variation in growth rates that occurred between individuals is demonstrated in Graph 3. This graph shows the growth rate of 6 randomly selected individual lambs from Group 3 during the period they were on the feedlot. It can be observed that whilst some lambs had significant reductions in growth rates (between weighing sessions) there was quite often compensatory growth the following week. Further work is required to determine whether the performance of a lamb can be predicted from early growth rate performance.

Lambs with a negative return had on average a 23% lower growth rate. Although growth rate has a key influence on net return the correlation is low (see Table 3 and Graph 4).

Net return

Net profit is determined by income received less operating and overhead costs. In this work overhead costs were not taken into account and therefore only net returns were calculated. This needs to be taken into account when reviewing the data.

The average net return per lamb was $9.55, $2.35 and $4.45 and for Groups 1, 2 and 3 respectively (see Table 1). Between 8 and 40% of lambs within each group returned a negative

return (see Table 3), and on average there was a $25/lamb difference in the profitability of the top and bottom 10% of lambs within each group. The lambs returning a negative return tended to have a lower growth rate and therefore a longer period in the feedlot. They also had a lower carcase weight and quite often a lower carcase price, a result of failing to meet specification.

There were large differences in the performance of lambs from the different sources in Group 2. The most profitable source (2a) returned $5.06 per lamb whereas the least profitable (2d) had an average loss of $0.69. As expected, there were multiple factors impacting on profit, including purchase price, price received, entry weight, average growth rate, dressing percentage and sale price (achieving market specification).

Lambs from source 2a were more profitable than 2d due to their lower purchase price ($1.16 vs. $1.23 per kg LW), significantly higher growth rates (560 vs. 402 g/day), heavier at entry (39.8 vs. 34.6 kg) and fewer days in the feedlot (22 vs. 41 days). However, the overriding importance of purchase price in comparison to entry weight is illustrated by Group 1, which was the most profitable of all groups despite an entry weight significantly less than the Q-lamb alliance recommendations of 38 kg (R. Crabb pers. Comm.).

Table 4: Impact of changing one variable at a time on the net return from a feedlot lamb
(Base net return in example is $5.60 per head)

Variable	Actual change	% change in variable	Impact on net return
Price received ($/kg hcwt)	40c increase ($3.10 to $3.50/kg hcwt)	13% change	154% increase
Purchase price (c/kg LWt)	16c decrease ($1.16 to $1.00 c/kg lwt)	14% change	144% increase
Growth rate (g/hd/day)	210 g/hd/d decrease (560 to 350 g/hd/d)	38% change	124% decrease
Dressing %	2% increase (43 to 45%)	5% change	56% increase
Feed cost ($/tonne)	$70 increase ($330 to $400/tonne)	21% change	40% decrease
Skin price	$2.50 increase ($1.00 to $3.50)	250% change	44% increase
LWt in (kg)	4 kg decrease (40 to 35 kg)	13% change (results in 45% increase in days in)	27% increase
Freight	$0.50 decrease ($3.00 to $2.50 per head)	17% change	9% increase

Since multiple factors impact on the net return there is a need to achieve the right balance between all of the factors to ensure a positive outcome. Table 4 demonstrates the impact of changing a single variable on feedlot net return. Varying a number of these factors can significantly influence the final return. For example, a significant increase in feed cost (i.e. 21% increase, from $330/tonne to $400/tonne) can be nullified by a decrease in purchase price (i.e. 5% decrease from $1.15 to $1.09 /kg lwt) or a higher growth rate (i.e. 19% increase from 350 to 420 g/hd/d). A 3% decrease in purchase price and 6% increase in growth rate will achieve the same affect.

Within Group 1, eighteen lambs were removed early from the feedlot to fill an order for light weight carcases. This had a significant impact on the returns for these lambs with only an average return of $1.40 per head being achieved. These lower return lambs can be clearly seen in Graph 4. Despite most of these lambs having very good growth rates the sale price nullified this. Failing to meet specification was a key factor contributing to a negative return. This highlights the importance of growing lambs out to specification and in most cases a higher return (i.e. light weight average price was $1.81/kg hot carcase wt cf Q lamb price of $2.90).

Whilst the number of days in the feedlot has an influence on returns, it appears that achieving target specification is more important. Whilst the point of zero return will depend on all the variables for Group 2, it was approximately 35 days. Beyond this time, growing a lamb out to specification would result in a lower loss than removing a lamb early from the feedlot. Being able to ensure a lamb will grow out to specification may not always be possible.

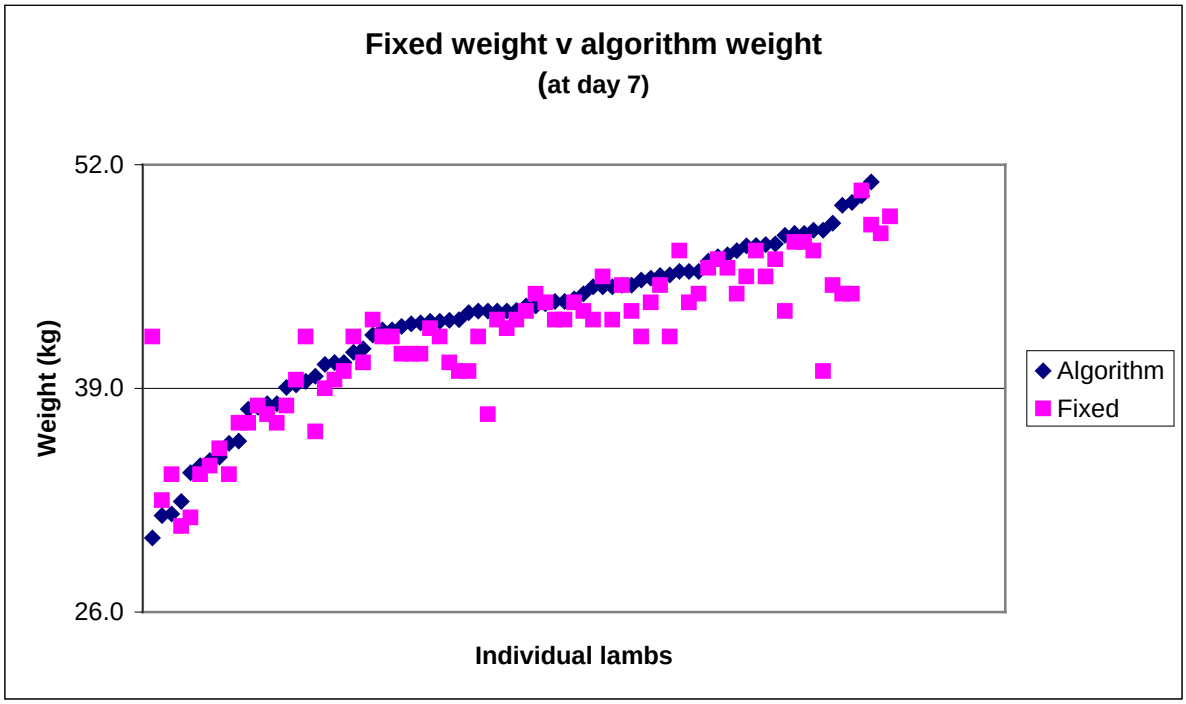
Walk Over Weigher

A number of modifications were made to the Walk Over Weigher (WOW) during the trial period. The most important change was a redesign of the system to enable a fixed weight to be recorded. The new system has been renamed, the Lamb Automatic Weigher & Drafter (LAWD).

There were a number of issues with the WOW in the feedlot. Initially the machinery was based on a design developed by CSIRO in NSW. This system was installed without enough thought about what was needed for the feedlot situation. The requirements for a feedlot are; a real time fixed weight on any given day, growth rate data and predicted finishing times and the ability to draft lambs on predetermined criteria.

The WOW had the ability to collect weight data, however this needed to be downloaded and corrected through an algorithm (developed by NSW DPI). This provided an estimated weight for the period. The variation in the predicted algorithm weights compared to the fixed weight at day 7 was too great to provide the required data for the feedlot situation (see Graph 5).

Graph 5. Fixed weight v calculated algorithm weight

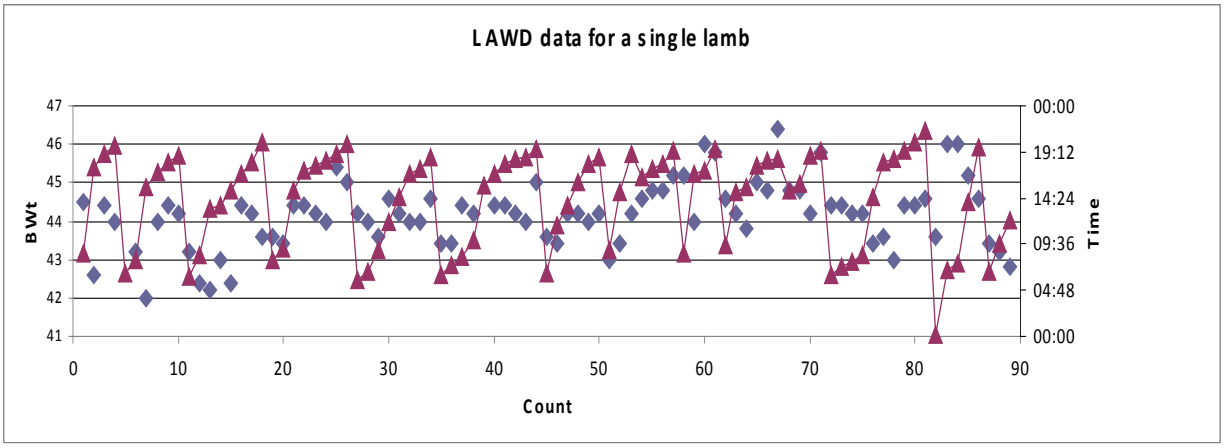


The calm but inquisitive behaviour of the lambs in the feedlot also provided the opportunity to make modifications to the WOW. Whilst in the field, steps have been needed to slow sheep through the WOW system, this was quite the opposite in the feedlot. Lambs would often stand and remain in the WOW for some time. This behaviour lead to the development of the LAWD which captures a fixed weight before lambs are released and/or drafted.

Graph 6 provides some preliminary data from the LAWD for one lamb over a period of 10 days. It has shows the weight and the time at which the weight was recorded. This lamb was walking over the LAWD up to 10 times per day. These recordings generally occurred early in the morning and late in the afternoon. There was an obvious increase in weight during the day and a subsequent loss over night.

For further detail on the WOW in the feedlot and the development of the LAWD see the report 'Walk Over Weighing in lamb feedlots' by Rob Shepherd and Ian McFarland.

Graph 6. Data from the Lamb Automatic Weigher & Drafter



CONCLUSION

This work highlights the considerable variation in the performance and profitability of individual lambs and groups of lambs finished in a commercial feedlot, and that multiple factors need to be considered to make a profit from feedlotting lambs given current prices. It also demonstrates that average lamb growth rates exceeding 350g/day are achievable under commercial conditions, but further work is required to determine the appropriate management strategies given the ability to track individual lamb performance.

Further work should focus on guidelines for the early identification of poor performing lambs in the feedlot. Strategies also need to be developed to match lamb performance with the most appropriate market. It may be more economical to take high growth rate lambs out to a heavier carcase specification rather than a lighter weight. The Lamb Automatic Weigher & Drafter offers potential for improving feedlot efficiency but also needs to be investigated further.

References

Anderton, L. (2005) 'Finishing lambs in a feedlot – Is it profitable?' in 2005 Proceedings of Sheep Updates. Department of Agriculture WA.