Economic valuation of confinement feeding yr1

Michael Young (YoungsFarmAnalysis)

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Contents

Background

Confinement feeding is an intensive feeding system where livestock are confined to a relatively small area and are hand fed grain and hay. Feeding stock in a confined area allows producers to provide full or partial rations and for pastures to be rested. It is a valuable management strategy, providing numerous benefits:

1. Deferment of pasture paddocks resulting in increased leaf area and growth rates.
2. Reduces stock energy requirements by 8-15% (less walking for feed and water).
3. Reduced supplement wastage (5-10%).
4. Manual stock feeding is quicker and easier.
5. Stock health and weight can be easily monitored, and sale stock separated.
6. Maintains paddock groundcover, reduces erosion and maximises rain infiltration.

However, confinement feeding does have costs, mainly infrastructure and feed costs. As a result, confinement feeding may only be profitable some of the time and likely depends on other management aspects of the farm. For example, with a low stocking rate pasture will be less limiting and therefore increasing pasture production due to deferment or reducing animal energy requirement will not be as valuable.

In this report we use whole farm economic modelling to evaluate the profitability of confinement feeding on three case study mixed sheep and crop farm businesses in Western Australia. The aim of this analysis is twofold. Firstly, provide an understanding of the economics behind confinement feeding strategy. Secondly, provide an understanding of how factors within the farming system effect the economics of confinement feeding.

For more information about how to implement a confinement system see:

1. https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/feed/confinement-feeding-cattle-drought
2. https://www.mla.com.au/research-and-development/livestock-production/livestock-nutrition/drought-feeding/confinement-feeding/
3. https://www.agric.wa.gov.au/autumn/confined-paddock-feeding-and-feedlotting

Modelling Method

Assessing the value of confinement feeding is not a straightforward task. In many cases, confinement feeding is used at the beginning of the year to defer pastures and increase future productivity. The value of deferring pastures depends on the value of feed throughout the year, which is affected by livestock and feed management throughout the year. Thus, to evaluate confinement feeding requires an analysis method that factors in the whole farm feed budget including the complexities of pasture production and quality throughout the year.

For these reasons, we used a whole-farm model called AFO to aid the analysis. Full details of the model can be found here: AFO documentation. In summary, AFO is a whole farm linear programming model that supersedes the popular MIDAS model. The model represents the economic and biological details of a farming system including modules for rotations, crops, pastures, sheep, crop residue, supplementary feeding, machinery, labour and finance. Furthermore, it includes land heterogeneity by considering enterprise rotations on any number of soil classes.

For the analysis AFO was calibrated to the case study farms where possible, including; stocking rate, pasture area, stock genotype and flock structure, confinement time period, time of lambing and supplement fed.

On-farm data was used to calculate the additional supplement required in confinement (which factors in wastage reduction and reduced energy requirement of stock in confinement) and labour efficiency gains of feeding supplement in confinement versus paddock feeding. The economic value of the extra FOO resulting from deferment during the confinement period was estimated using AFO. The extra FOO at the end of the confinement period was calculated from on-farm data that included the period of confinement, the number of stock in confinement, stock daily intake, and the proportion of green feed in the diet of stock when paddock grazing.

Value of confinement feeding - Case study analysis

Farm 1

Farm 1 is a 2400 ha mixed farm running 60% crop with a 100% merino flock. Running approx. 7500 ewes, lambing in July, and selling weathers as lambs or shippers at 18 months of age. 4179 ewes were confined from the end of March until mid-May. In confinement, feeding time was reduced by 35% (63 hours total) and mortality was 1% lower as a result of improved monitoring.

Extra FOO at the end of confinement resulting from deferment was estimated to be 64kg/WGHa. This was calculated from:

- 4179 ewes confined for 41 days, 28 of which were after the break of season when pasture is growing.
- 1.55 kg DM/hd non-confined ewe intake during the confinement dates. Calculated using production relationships from Freer et al. (2007).
- 30% of non-confined ewe intake coming from green pasture during the confinement dates.

Table 1: Summary of performance metrics in confinement.

Metric	Confinement gains
Labour efficiency gains during confinement period	10.75 hrs/week
Reduced supplement wastage (5%)	2.33 kg/hd
Pasture production gains [1]	64 kg DM/ha
Energy efficiency gains of stock in confinement [2]	0.8 mj/d/hd
Mortality rate reduction	1%

[1] Additional pasture growth during confinement period.

[2] Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 2: Costs and benefits of confinement feeding

Costs	
Extra supplement	$0 [1]
Benefits	
Pasture deferment	$19,034
Labour reduction (@$40/hr inc super and wc)	$2,520
Mortality reduction[2]	$739
Gross margin	
	$22,293
	$3.6/DSE
	$23.2/Wgha

[1] Farm 1 fed the same level of supplement per head both in confinement and in paddock. Likely due to in paddock wastage and higher stock energy requirement.
[2] Estimated using AFO with the case study farm parameters.

Farm 2

Farm 2 is a 2500 ha mixed farm running 78% crop with a self-replacing merino flock mating surplus ewes to terminal sires. Running approx. 4200 ewes, lambing in July, and selling weathers as 8-month-old lambs. 4377 head were confined from the start of April until mid-June. In confinement, feeding time was reduced by 54% (120 hours total).

Extra FOO at the end of confinement resulting from deferment was estimated to be 241 kg/WGHa. This was calculated from:

- 2100 head confined for 56 days (49 of which were after the break of season when pasture is growing) and 2277 head confined for 76 days (69 of which were after the break of season when pasture is growing).
- 1.55 kg DM/hd non-confined ewe intake during the confinement dates. Calculated using production relationships from Freer et al. (2007).
- 30% of non-confined ewe intake coming from green pasture during the confinement dates.

Table 3: Summary of performance metrics in confinement.

Metric	Confinement gains
Labour efficiency gains during confinement period	24 hrs/week
Reduced supplement wastage (5%)	3.55 kg/hd
Pasture production gains [1]	241 kg DM/ha
Energy efficiency gains of stock in confinement [2]	0.73 mj/d/hd
Mortality rate reduction	No change

[1] Additional pasture growth during confinement period.
[2] Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 4: Costs and benefits of confinement feeding

Costs	
Extra supplement	$30,591
Benefits	
Pasture deferment	$32,376
Labour reduction (@$40/hr inc super and wc)	$4,800
Gross margin	
	$6,585
	$1.0/DSE
	$11.9/Wgha

Farm 3

Farm 3 is a 7500 ha mixed farm running 76% crop with a self-replacing merino flock mating surplus ewes to terminal sires. Running approx. 7800 ewes, lambing in June/July, and selling weathers as lambs. 2000 head were confined from the start of April until mid-May. In confinement, feeding time was reduced by 75% (101 hours total).

Extra FOO at the end of confinement resulting from deferment was estimated to be 67 kg/WGHa. This was calculated from:

- 600 head confined for 25 days (15 of which were after the break of season when pasture is growing) and 1400 head confined for 43 days (33 of which were after the break of season when pasture is growing).
- 1.55 kg DM/hd non-confined ewe intake during the confinement dates. Calculated using production relationships from Freer et al. (2007).
- 30% of non-confined ewe intake coming from green pasture during the confinement dates.

Table 5: Summary of performance metrics in confinement.

Metric	Confinement gains
Labour efficiency gains during confinement period	16.4 hrs/week
Reduced supplement wastage (5%)	4.12 kg/hd
Pasture production gains [1]	67 kg DM/ha
Energy efficiency gains of stock in confinement [2]	0.76 mj/d/hd
Mortality rate reduction	0.5%

[1] Additional pasture growth during confinement period.
[2] Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 6: Costs and benefits of confinement feeding

Costs	
Extra supplement	$13,750
Benefits	
Pasture deferment	$19,449
Labour reduction (@$40/hr inc super and wc)	$4,040
Mortality reduction[1]	$369
Gross margin	
	$10,108
	$3.4/DSE
	$5.62/Wgha

[1] Estimated using AFO with the case study farm parameters.

Summary of findings

The value of confinement feeding is primarily due to:

- Reduced labour and cost of supplementary feeding
- Reduced supplement wastage
- Increased energy efficiency of stock
- Increased pasture production due to deferring

However, there are some other factors not included in this analysis that may increase the value of confinement feeding including:

- Benefits to the cropping enterprise if confinement allows cropping paddocks to be destocked earlier.

- Benefits to the livestock enterprise if confinement feeding allows stock to be monitored more closely and hence managed more optimally i.e. follow optimal nutrition profile that maximises the trade-off between feed costs and reproduction.
- Maintains paddock groundcover, reduces erosion and maximises rain infiltration.

The economic value of confinement feeding varies due to both external market and climate conditions and internal management practices including: (i) time of lambing; (ii) stocking rate; (iii) pasture area; (iv) grazing management prior to adopting confinement feeding; (v) confinement set up; (vi) confinement period. For example, Table 7 shows that the value of deferred pasture varies by up to 72% depending on seasonal conditions. The reason the value of deferment changes by season type is because of the inflexible nature of farming systems. For example, farmers have to feed a similar number of stock irrelevant of the seasonal conditions. So, in a poor year, when the grazing pressure is high, additional feed has a higher value.

Table 7: Value of pasture deferment in different seasons.

	Good season	Medium season	Poor season
Pasture deferment [1]	$5,854	$16,834	$20,683

[1] Average of case study farms

As this analysis was a case study, we did not complete any sensitivity analysis (other than the season type sensitivity) to examine how varying the above factors effects the profitability of confinement feeding (this would be valuable future work that would aid the adoption of confinement feeding). Therefore, if/when extrapolating these results to other properties care must be taken.

However, some key findings that were similar across properties are:

1. Confinement feeding was profitable in all cases. Varying from $6,500 to $22,200.
2. Pasture deferment makes up approximately 80-90% of the economic value of confinement feeding.
3. Labour saved from confinement feeding offsets approximately 17-31% of the cost of additional supplement.
4. Confinement feeding before the break of season is less profitable because pasture is not being deferred.

Caveats:

This analysis was part of a small producer demonstration project and therefore had limited resources. As such, some simplifications were made:

- Liveweight data was not collected therefore it was assumed that stock in confinement and in the paddock are following the same liveweight profile during the confinement dates.
- Limited trial data so regional expected pasture production data has been used to examine the benefits of confinement feeding.

FREER, M., DOVE, H. & NOLAN, J. 2007. *Nutrient requirements of domesticated ruminants*, CSIRO publishing.