

# PALM KERNEL, GRAIN OR SILAGE – WHICH IS BEST?

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## Introduction

Often as dairy farmers we compare the price of the supplement we are buying on a price per kgDM basis. This is a simple but hugely inaccurate way of assessing which is the best supplement to buy.

The price per kgDM is only one of the four factors that we must look at each time we are buying feed. The important question is not “what is the price of the feed” but “what is the price of the energy down the cow’s throat”?

To get the price of the energy down the cow’s throat we must calculate the cost of feeding the supplement, the wastage and the amount of energy in the feed.

## The cost of feeding

### *Silage feeding costs*

#### *Interest*

The cost of debt servicing the silage wagon and grab are the only factors looked at here. Often farmers go to bigger tractors to handle the quantity of silage fed so the capital cost and therefore interest cost should be higher. On top of this cost is the cost of the silage pad or bunker and its maintenance.

Allowing for \$46,000 of capital at 8% interest, this is \$3,680/yr.

#### *Depreciation*

The depreciation of the gear is associated with the people operating the gear. The depreciation can be as high as \$46,000/yr or as low as \$2,000/yr.

Allowing for \$46,000 of capital at 10% depreciation this is \$4,600/yr.

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### *Repairs and maintenance*

The factors that drive your depreciation also drive your R&M – that's your staff. Allowing for a new wagon the R&M is set low at \$1,840/yr. With an older cheaper wagon the R&M would be considerably higher but the depreciation would be lower.

### *Tractor and labour*

I have worked this out based on 1,500kgDM per 45mins at \$63/hour for the tractor and labour. For 200t of DM this is \$6,300/year.

### *Total silage feeding cost*

Interest	\$3,680
Depreciation	\$4,600
Repairs and maintenance	\$1,840
Tractor and labour	\$6,300
Total	\$16,420 per year

So for a year's silage feeding the cost is \$16,420. Assuming you fed 200t of DM this is 8.2c/kgDM. With a cheaper wagon (\$20,000) and therefore lower interest and depreciation but higher R&M and labour cost, the price of feeding could drop to 7.1c/kgDM.

### ***Palm kernel feeding costs***

#### *Interest*

The capital here is the cost of two feeders to tow behind the four-wheeler motorbike plus reinforcing the hay barn walls and a concrete pad for a bunker. You need one feeder per 250 cows and I have allowed for the fibreglass feeders. The bunker is the actual cost of a bunker made this last season.

Total capital \$18,000 x 8% = \$1,440.

#### *Depreciation*

The bunker will not depreciate very much. I allowed for \$700/yr depreciation.

#### *Repairs and maintenance*

The R&M is low. I allowed \$300/year.

#### *Tractor, four wheeler and labour*

You need the tractor to push the palm kernel (PK) into the bunker and load the PK into the bins. The four wheelers then tow the bins into the paddock and pick them up again when the herd is brought in for milking. The bins hold 500kgDM so the small quantity fed in one bin does increase the costs. I allowed 10 minutes with the tractor and 10 minutes with the four-wheeler. You would have 400 trips to feed 200,000kgDM at \$14.50 per load = \$5,800.

*Total palm kernel feeding cost*

Interest	\$1,440
Depreciation	\$ 700
Repairs and Maintenance	\$ 300
Tractor 4 Wheeler and Labour	\$5,800
Total	\$8,240 per year

So for a year's palm kernel feeding the cost is \$8,240. Assuming you fed 200t of DM this is 4.1c/kgDM.

***Grain feeding costs***

*Interest*

The capital cost for a grain feeding system for a 60 bail rotary is \$70,000 which is \$5,600/yr in interest at 8%. This system is with its own crusher so the farmer is not forced to feed pellets.

*Depreciation*

The depreciation is relatively low due to the limited number of moving parts. I allowed \$3,500/yr.

*Repairs and maintenance*

This is one of the factors that attract farmers to grain feeding – there is low labour input with few moving parts so R&M is very low. I allowed \$600/yr.

*Power*

The main cost is the crushing. I budgeted on \$1,800/yr.

*Total grain feeding cost*

Interest	\$5,600
Depreciation	\$3,500
Repairs and Maintenance	\$ 600
Power	\$1,800

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Total \$11,500 per year

For a year's grain feeding the cost is \$11,500. Assuming you fed 200t of DM this is 5.75c/kgDM.

So the cost of feeding the supplement varies from 4.1c/kgDM for PK up to 8.2c/kgDM for silage. Grain cost 5.75c/kgDM.

## **Wastage**

### ***Silage***

#### *Field respiration and harvest*

When you mow a paddock for silage the plant still respire using up energy and therefore reduces the drymatter. The longer the grass is left to wilt the higher the drymatter loss.

Assuming the contractor is competent the actual harvest loss will be quite low.

Overall loss is usually around 10% for pit silage. With baled silage being wilted longer the drymatter loss is higher – usually 15%.

If you are buying the silage delivered to your farm the field and respiration losses are irrelevant unless the drymatter is assessed in the paddock not in the pit.

#### *Fermentation*

This is the process of making silage – or compost if you do the job badly. To ensure you get low fermentation losses you need quality grass, good compaction and airtight covers. This is why baled silage tends to have a lower loss as the bale is well compacted and sealed.

A perfect silage making process will still result in losses of around 5%.

#### *Surface losses*

This is the loss that occurs on the front of a stack of silage as it is exposed to the air. The ideal stack for low wastage is a narrow long stack – this is so there is less face exposed to the air at any time. Sometimes the face can become large when covers are blown off or holed – so losses increase.

#### *Feeding*

This is the wastage that occurs between loading the wagon and cows eating the silage in the paddock. In Canterbury the losses may be as low as 5% if you have excellent staff and soil conditions are very dry. As we saw last winter though, losses can be up to 50%

The loss from baled silage tends to be lower due to the grass being longer chop so less silage is tramped into the ground.

The table below summarises all the loss factors and percentage loss.

**Table 1:** Silage wastage

	<b>Pit Silage</b>	<b>Baled Silage</b>
Field respiration and harvest	10%	10 - 20%
Fermentation	5 – 10%	3 – 5%
Surface	3 – 15%	3%
Feeding	5 – 50%	5 – 50%
Total loss excluding field and harvest loss	15 – 55%	11 – 40%

The normal degree of loss in Canterbury is 20–25% and 35% in Otago Southland.

### ***Palm kernel and grain***

The wastage when you feed grain in the dairy shed is minimal. The same applies for PK if it is stored in a silo and fed in the dairy shed, but PK is usually stored on a pad and then fed in the paddock.

When palm kernel is stored in a good bunker and fed in an appropriate bin the losses are around 8%. If the PK is stored on the ground with a silage cover the likely losses are 13%.

### **Feed value**

The best measure of the feed value of a feed is the megajoules of metabolisable energy per kilogram of drymatter (MJME/kgDM) – more commonly known as ME. This is the amount of energy that is available for the cow for maintenance and production.

When we buy feed we need to compare the energy of the feed. Silage is usually from 9–11ME, palm kernel 10.5–11.5ME, barley 12–13.3ME and wheat 12.5– 3.7ME.

### **Cost of energy down the cow's throat**

When we take into account the cost of feeding, the wastage, the feed value and finally the price of the supplement we get the true cost of the energy down the cow's throat.

The table below shows the comparison of the three feeds.

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**Table 2:** Relative cost of each feed

	<b>Silage</b>	<b>Palm Kernel</b>	<b>Barley</b>
Price	22c/kgDM	\$240/t – 90% DM	\$260/t – 85% DM
Wastage	23%	8%	
Covering	0.7c/kgDM		
Feeding Cost	8.2c/kgDM	4.1c/kgDM	5.75c/kgDM
Energy MJME/kgDM	10	11	12.5
Price per MJME – down the cow's throat	3.77c/MJME	3.01c/MJME	2.91c/MJME

**Table 3:** The cost of grass silage fed – 23% wastage. The top line of the table is the landed price of the silage on farm. The prices shown are c/MJME

	<b>19c/kgDM</b>	<b>20c/kgDM</b>	<b>21c/kgDM</b>	<b>22c/kgDM</b>	<b>23c/kgDM</b>	<b>24c/kgDM</b>
9 MJME Per kg DM	3.75	3.9	4.04	4.19	4.33	4.48
10 MJME Per kg DM	3.38	3.51	3.64	3.77	3.9	4.03
11 MJME per kg DM	3.07	3.19	3.31	3.43	3.54	3.66

**Table 4:** The cost of grass silage fed – 35% wastage.

	<b>19c/kgDM</b>	<b>20c/kgDM</b>	<b>21c/kgDM</b>	<b>22c/kgDM</b>	<b>23c/kgDM</b>	<b>24c/kgDM</b>
9 MJME Per kg DM	4.28	4.45	4.62	4.79	4.96	5.13
10 MJME Per kg DM	3.85	4.00	4.16	4.31	4.47	4.62
11 MJME per kg DM	3.50	3.64	3.78	3.92	4.06	4.20

**Table 5:** The cost of palm kernel fed – 8% wastage. The top line of the table is the landed price per tonne. The prices shown are c/MJME

	\$210/t	\$220/t	\$230/t	\$240/t	\$250/t	\$260/t
10 MJME Per kgDM	2.95	3.07	3.19	3.31	3.43	3.55
10.5 MJME Per kgDM	2.81	2.92	3.04	3.15	3.27	3.38
11 MJME per kgDM	2.68	2.79	2.90	3.01	3.12	3.23

**Table 6:** The cost of grain fed (either barley or wheat). The top line of the table is the landed price per tonne. The prices shown are c/MJME

	\$230/t	\$250/t	\$270/t	\$290/t	\$310/t	\$330/t
12 MJME Per kgDM	2.73	2.93	3.13	3.32	3.52	3.71
12.5MJME Per kgDM	2.62	2.81	3.00	3.19	3.38	3.57
13 MJME per kgDM	2.52	2.70	2.89	3.07	3.25	3.43

So barley or wheat at \$260/t is 23% cheaper than grass silage landed on farm for 22c/kgDM. Grass silage would need to be less than 17c/kgDM and 10.5ME for the silage to be a similar price down the cow's throat as barley at \$260/t.

Barley at \$310/t is the same price down the cow's throat as 11ME grass silage landed for 21c/kgDM.

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## **issues**

### ***Consistency***

Grain is the most consistent of the three feeds. Quality of grain is still important but it does tend to vary less than silage. You want a low screening percentage and a high seed weight when purchasing grain.

The feed value of the palm kernel is dependant on how much of the oil has been extracted. The feed value of PK comes from the oil and the fibre in the feed.

If palm kernel gets wet, losses increase and toxins can grow in the feed. This reduces the feed value and can potentially cause animal health concerns.

### ***Cow condition***

Grain is more efficient at putting on condition than silage. It takes around 220kgDM of grass silage, 160kgDM of maize silage and 135kgDM of grain to put on one condition score. So if you are trying to put weight on cows, the cost of grain to do this is reduced even further than for silage, when we allow for this improvement in efficiency.

### ***Palm kernel***

Cows don't overload on palm kernel as they do with grain. This allows the PK to be fed in a bin in the paddock.

Most cows will only eat around 2kgDM/cow/day. This can be lifted to 4kg/cow if needed but this is about the limit unless the cows are really hungry.

Anything over 4kgDM/cow/day and the cow's milk production will be limited due to inability to process the PK, ie, too much fibre.

Those of you out there who think they need to feed straw for their cow's feet should feed palm kernel instead. The PK will give the fibre and the energy will be 11ME vs. 6.4ME for the straw.

### ***Economics***

The big risk with grain feeding is inefficiency of feeding, since it is so easy to feed. Feeding supplement in the shoulders of the season is economic at most payouts – but feeding all season and running a higher stocking rate is not economic - unless the payout is above \$4.80/kgMS.

Australian trials have shown an average response when feeding grain all season of 54 – 56gMS/kgDM (source Jennifer Burke NZ Dairy Exporter). At a \$4.15 payout this is a return of 23c/kgDM.

In the Kolver, Roche, Burke and Aspin trial in 2003 and 2004 where cows were feed all milking season the response for the season ranged from 35–71gMS/kg concentrate DM.



A Ruakura trial in 1998 on milk production responses to supplement (not grain) found

- Spring 11 – 82gMS/kgDM – without calving earlier.
- Summer 53 – 85gMS/kgDM
- Autumn 110 – 200gMS/kgDM.

So the trials clearly show that at the current payout it is only economic to feed supplement in the shoulders of the season to get more days in milk.

## Summary

The purchase price of a supplement is less than half the story. We need to calculate the price of energy down the cow's throat, not sitting in a bun in the paddock.

The three other critical factors are: the cost of feeding; the amount of wastage; and the feed value.

Barley or wheat landed on farm at \$260/t is 23% cheaper than grass silage at 22c/kgDM.

Grass silage would need to be 11MJME and landed on farm for 21c/kgDM to be the same cost as grain at \$310/t.

For sharemilkers without a grain feeder in the dairy shed, palm kernel is a realistic option in comparison to silage.

In areas where the wastage associated with feeding silage in the paddock is very high, grain becomes even more viable as an option.

Supplement feeding is economic in the shoulders of the season to give more days in milk. At the current payout it is not economic to feed supplement all season.

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