Economics of concentrate feeding

Findings from the "Sustainable dairy farm systems for profit" project

M5 Project Information Series - Studies on Mutdapilly Research Station and subtropical dairy farms 2001 to 2005

Ross WALKER, Graeme BUSBY and David BARBER

edited by ***Anne CHAMBERLAIN***

Information updated May 2006

Overview

A HIGH rate of concentrate feeding is profitable - if coupled with maximum production and utilisation of homegrown forage, a balanced ration and high milk production per cow. Responses of 1 litre of milk per kg of concentrate are widely accepted.

With an average concentrate cost of $242/tonne, it is estimated that the grazed farmlet herds in the *Sustainable dairy farm systems for profit* project produced extra milk from concentrate for a margin of 10 cents per litre.

High production per cow is crucial to profitably feeding concentrates – so the cost of grain and protein meals is spread over a larger volume of milk and components. The Mutdapilly farmlet herds averaged 6,148 to 9,182 litres per cow/year, compared with the regional industry average of 5,000 litres per cow.

The planned level of concentrate feeding for the farmlet herds was based on the industry average forage/concentrate ratio of 60/40. The goal was to use concentrates to optimise milk production from forage, rather than to feed a higher proportion of concentrate

The method of feeding concentrates becomes important when feeding more than 3 kgs per feed. To avoid slug feeding and to obtain optimum milk production from high levels of concentrate, look at feeding smaller amounts more frequently, or feed the concentrate as part of a mixed ration with a forage source.

Industry background

IN recent years, with high and variable commodity costs and lower average milk prices, dairy farmers in the subtropical region have been reluctant to increase concentrate feeding. Many have actually reduced their use of concentrates.

One of the aims of the farmlet component of the *Sustainable dairy farm systems for profit* project was to study and measure the impact of intensifying the common farming systems of the region – including increased levels of concentrate feeding to maximise forage utilisation and to support higher production per cow.

Mutdapilly M5 farmlets

Farmlet	Production system
M1 Raingrown	Raingrown tropical grass pastures plus oats
M2 Limited irrigation pasture	Raingrown tropical grass pastures plus a small component of annual ryegrass
M3 Limited irrigation crops	Forage crops plus a small component of annual ryegrass
M4 High irrigation pasture	Predominantly irrigated annual and perennial temperate pastures plus summer forage crops
M5 Feedlot	Based on home grown maize and barley silage, lucerne hay/silage with purchased concentrates

Lessons from the M5 project

THE five farmlets set up at Mutdapilly Research Station shared the principle of optimising forage production and utilisation from the existing natural

Queensland Government
Department of Primary Industries and Fisheries

resource base, and to complement this with purchased concentrates.

Each farmlet maximised cow numbers for the amount of forage grown, and successfully and profitably fed 3 tonnes of concentrate per cow per year (equivalent to 10 kg/cow/day) over four years.

This level of concentrate was based on the industry average of 60% forage and 40% concentrate DM in milking cows' diets. In reality, the average (homegrown + purchased) forage : concentrate ratios were 50/50 for M1, 51/49 for M2, 55/45 for M3, 57/43 for M4 and 66/34 for M5.

The concentrate consisted of mixed grains, sorghum, barley and wheat; cottonseed and soybean meals, molasses and whole cottonseed, with formulation adjusted seasonally on the basis of forage nutrient content and availability and the herd's level of production and stage of lactation. All herds received trace minerals and phosphorus. The average concentrate ration fed is presented in *Table 1*.

TABLE 1. AVERAGE concentrate ration fed to each farmlet herd (kg/cow/day as fed).

	M1	M2	M3	M4	M5
Grain	5.3	5.0	7.8	8.3	5.8
Molasses	3.1	2.4	0.1	-	-
Protein meal	1.0	1.0	0.8	0.3	1.9
WCS	1.3	1.7	1.7	1.9	1.6
Minerals	0.2	0.3	0.3	0.3	0.4
Total	10.9	10.4	10.8	10.7	9.7

As well as feeding higher rates of concentrate, each farmlet used a higher stocking rate than the industry average. Stocking rates for each farmlet were: M1 1.9 cows/ha; M2 2.7 cows/ha; M3 1.4 cows/ha; M5 3.3 cows/ha; and M5 4.3 cows/ha. The focus was maximum production and utilisation of forage, including conservation of any surplus.

Feeding Method

Method and timing of feeding to avoid slug feeding was an important management consideration with the higher rates of concentrate.

The grazed farmlet herds M1 and M2 were fed their concentrate rations as 4 kg of mixed grain per day in the dairy, with the balance of grain and protein meal, plus a small amount of forage, in a partial mixed ration once a day.

PHOTO 1. M2 COWS were fed a limited-forage partial mixed ration once a day along a fence line in a concrete trough.

The M3 and M4 grazed herds were also fed 4 kg of grain daily in the dairy, and the balance of their grain and protein outside the dairy in troughs twice a day.

The M5 feedlot herd was fed a total mixed ration twice a day with no feeding in the dairy during milking.

Additional conserved forage, either homegrown or purchased, was fed in the paddock in round-bale feeders to the M1, M2, M3 and M4 herds as required through the year.

Milk Production per Cow

High milk production per cow is crucial to profitably feeding high rates of concentrate – to spread the costs of grain and protein meals over a large volume of milk.

Over four years, farmlet M1 averaged 6,148 litres/cow/yr; M2 averaged 6,534 litres/cow/yr; M3 yielded 6,871 litres/cow/yr; M4 produced 7,3954 litres/cow/yr; M5 averaged 9,182 litres/cow/yr.

The regional average remains at around 5,000 L/cow/year. Queensland Dairy Accounting Scheme (QDAS) farms averaged 5,310 litres per cow in 2004/05.

Other Benefits

Feeding high-energy concentrate supplements to a milking herd has direct benefits to milk production, and the additional supply of non-fibre carbohydrates - mainly starch - also has the

potential to lift milk composition, particularly milk protein.

The farmlet herds averaged 3.13 to 3.18% milk protein and 3.90 to 4.08% milk fat over the four years of measurement.

Cow condition and reproduction can also benefit. Average liveweight of farmlet herd cows was 540kg (for the M1 raingrown pasture herd) to 608kg (for the M5 feedlot herd)

Grain and protein supplements bring a lot of nitrogen, phosphorous and potassium onto the farm, which has the potential to reduce the use of purchased chemical fertiliser. However, these nutrients are deposited unevenly over the farm – typically around loafing areas, laneways and gateways. As farms intensify, they need to consider how to better distribute and make use of these imported nutrients.

Costs

The average and range of cost of concentrates purchased for farmlet rations are presented in *Table 2*.

TABLE 2. THE AVERAGE and range in purchase costs of concentrates.

Feed	Range cost $ / tonne	Average cost $ / tonne
Barley	158 to 312	225
Wheat	205 to 340	264
Sorghum	140 to 335	205
WCS	195 to 548	314
CSM	291 to 461	375
SBM	515	515
Molasses	111 to 135	116

Table 3 presents the average cost of each farmlet's concentrate ration in each year of the project.

TABLE 3. THE AVERAGE concentrate mixture cost over the 4-year project for each farmlet ($/tonne).

	2001-02	2002-03	2003-04	2004-05
M1	214	273	224	209
M2	222	296	227	204
M3	247	321	223	224
M4	239	317	223	212
M5	272	354	267	243

The range in costs reflects the different amounts of protein meal and minerals in the rations.

Over the 4-years of the project, the average cost per litre of milk for purchased grain, protein, minerals and forage was lowest for the M4 farmlet – due to higher production per cow and a lower requirement for protein meal, with higher quality pastures throughout the year. *Table 4* presents average production costs for each farmlet.

TABLE 4. THE FOUR-YEAR average cost of purchased feed and home grown forage, plus total variable cost (TVC) for each farmlet herd (cents/litre).

	Purchased feed	HG forage	TVC
M1	14.9	2.7	26.1
M2	14.4	3.5	26.0
M3	12.1	3.7	24.0
M4	11.1	4.8	23.2
M5	12.6	4.2	24.6

These costs compare favourably with the 2004/05 QDAS average of 11.0 c/L for purchased feeds on commercial dairy farms

The average cost of concentrate (with molasses) was $242 per tonne for the grazed farming systems. Assuming each kg of concentrate (costing 24.2 cents) produced an additional 1 litre of milk (returning an average of 34.2 cents), the margin for concentrate feeding averaged 10 c/L

The farmlets demonstrated that high rates of concentrate feeding are profitable when combined with high production per cow, high forage utilisation and high stocking rate. Strategies such as conserving surplus forage are also very important to profitability.

The M4 (high irrigation) farmlet in particular demonstrated that - even during periods of high commodity prices - higher rates of concentrate feeding (3 tonnes/cow/year) can be profitable if the feed-base fundamentals are right. Despite having only half the irrigation water it was designed to have, the M4 farmlet was the most profitable of the grazing systems because it still managed to grow, graze and conserve most of the herd's forage requirements.

M5 Companion farm experiences

AT workshops and seminars conducted during the farmlet study, companion farmers made several important observations about the potential for increased concentrate feeding.

- There was a general recognition that it is possible to profitably produce 7,500 litres per cow from home grown forage plus 3 tonnes of concentrate – for an average purchased feed cost of around $250 a tonne, and a total feed-related cost of 12 to 14 c/L.
- When feeding 3 tonnes of concentrate per cow per year, an extra 1 litre of milk/cow/kg of concentrate potentially adds 600,000 litres of milk production annually from a 200-cow herd. If stocking rate is increased to the potential of the forage base, the production response is potentially higher because of higher forage utilisation.
- Companion farmers feeding around 1.2 tonnes/cow/year (4 kg/cow/day) were considering or had already increased concentrate feeding levels to 3 tonnes /cow/year (10 kg/cow/day) on the basis of the milk responses and increased profits demonstrated by the Mutdapilly farmlets.
- In hindsight, companion farmers who had reduced concentrate feeding due to higher commodity prices during drought - with subsequent loss of milk production and body condition – now believe they should have maintained or increased concentrate feeding to maintain milk production and cover costs.

Practical farm management aspects raised in relation to higher concentrate feeding included:

- To avoid slug-feeding in the dairy, alternative feeding systems will be required to raise concentrate intake above 6 kg/cow/day.
- Management of concentrate price becomes more important as the level of feeding increases. Alternatives such as forward contracting must be considered.
- Dust becomes more of an issue with higher levels of concentrate feeding in the dairy and with home-milling of the ration. The addition of vegetable oil and/or the use of pellets need to be considered and costed as alternatives to reducing dust levels.
- Attention to the possible effects of feed substitution is critical. This can be avoided by increasing stocking rate as concentrate levels increase, to ensure high forage utilisation.

Other studies

LONG term studies of feeding concentrates to dairy cows in Australia have recorded responses close to 1 litre/cow/kg of concentrate when stocking rate was high (around 3 cows/ha or 1.2 cows/acre), pastures were well fertilised and managed, and the herd consisted of good quality AI-bred Holstein Friesian cows. Higher yields of protein and fat accompanied the increased milk yield.

In studies where stocking rate was increased as concentrate levels increased - more cows were added to ensure that all forage was eaten - the production response was up to 3 litres/kg of concentrate.

The response tended to be the same on both tropical and temperate pastures, and increased slightly and stabilised with longer-term feeding. With lower stocking rate and lower forage utilisation, the response was low or zero.

Contacts

Ross Walker, Mutdapilly Research Station
Ph (07) 5464 8777
Email: **ross.g.walker@dpi.qld.gov.au**

Graeme Busby, Toowoomba DPI&F
Ph (07) 4688 1254
Email: **graeme.busby@dpi.qld.gov.au**

David Barber, Mutdapilly Research Station
Ph (07) 5464 8742
Email: **david.barber@dpi.qld.gov.au**

The *Sustainable dairy farm systems for profit* project at Mutdapilly Research Station and on associated commercial farms investigated the potential impact of intensification of five subtropical dairy farming systems on business productivity, on the social well being of farming families and on the farm environment.