Producing low cost milk from pastures

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Australian dairy farmers are among the most efficient in the world due primarily to milk production systems based on pasture. Pastures are responsible for 60-70% of a cows milk production and are without doubt the cheapest feed source. It has been suggested in the past that only 30-50% of pasture grown is utilised, meaning an increase in this figure would enhance profits through improved efficiency and/or increased milk production. This would also reflect in the cost of production.

Figures produced by the Dairy Farmers Group Dairy Accounting Scheme (DAS) indicate those farms which produce their own feed are the most profitable. This is irrespective of water, seed and fertiliser costs.

Cost of purchased feed is the single most important figure in calculating production costs. To significantly alter production expenses, purchased feed costs must be controlled. These costs contribute to over 60% of total feed related expenses on the majority of dairy farms throughout NSW. I suspect this scenario could be applied throughout most of Australia. DAS figures from SE Queensland for example show in 1995/96 the cost of purchased feed ranges from 2.4 cents/litre (cpl) to 19.5 cpl with 11.8 cpl or $568/cow being the average.

Total feed costs average out at 15.9 cpl or $762/cow. When the costs of purchased feeds (11.8 cpl) is taken from the total, only 4.1 cpl is used in producing pasture for the cows. On most farms this 4.1 cents provides in excess of 60% of the cows requirements as already mentioned.

With the threat of deregulation of the milk market and the intense competitiveness of export trade, combined with generally rising input costs, it is imperative dairy farmers are cost efficient producers. Obviously the farms which will remain viable are those with management aware of input costs, producing the best possible bottom line. As we all know lowest cost does not necessarily give the best end result, cost effectiveness is the key. To this end, farmers should define their aims, institute a business plan and, with agreed goals and timeliness, benchmark their activities ensuring success. There is no better way for dairy farmers to realise their objectives than to review their cost of production, starting with feed costs.

Table 1: The effect of pasture utilisation on feed cost (Source - Whitson, 1997).

Feed utilisation (kg of DM/hd/day)	Cost per tonne of feed ($/t of DM)
7,000	$143
10,000	$100
13,000	$77

Table 2: 1995/96 Dairy Farmers Dairy Accounting Scheme results from south east Queensland.

Cost of purchased feed (A)	11.8 cpl or $568/cow
Total feed cost (B)	15.9 cpl or $762/cow
∴ pasture production costs (B - A)	4.1 cpl or $197/cow
or 25 % of costs for 60 % of cows requirements	

Engsta Holdings, the family enterprise with which I am associated, initiated these steps with the establishment of our dairy at Forbes in December 1996. We have a clear and relatively simple aim; to be the most cost effective milk producer in Australia.

The properties "Buyuma" and "Nocoleche" form 490 ha on the Lachlan River east of Forbes, of which 296 ha may be flood irrigated. Approximately 85 ha are dedicated to dairy herd pastures, 50 ha to cereal crops, 80 ha to lucerne hay production, 60 ha to improved pastures for dairy heifers and dry cows, and 160 ha for beef cattle production. The average rainfall is 530 mm, while total rainfall for 1997 was 373 mm.

A milking herd of around 160 head determined these areas. By January 1999 this will increase to 200 head, consequently the current program is under review.

Irrigation from the Lachlan River is via two 300 mm centrifugal pumps with a maximum entitlement of 1885 megalitres. This can be supplemented with an as yet unequipped bore suitable for irrigation. During 1995/96 water usage across all enterprises averaged 5 megalitres per hectare.

During 1997 total butterfat production by the herd was 22001.5 kg. A milking cow requires approximately 25 kg of pasture dry matter for each kilogram of butterfat produced. Working with the 65 ha of milking pasture during last year, 150 head and subtracting the supplemented feed in the way of hay and grain, this equates to an approximate pasture use of 6 t DM/ha/yr. In other words, pasture producing 6 t DM/ha/yr and the same amount of supple-

mented feed will sustain the status quo[A].

To increase herd size and herd production, this figure therefore needs to be improved, making allowance for extra area and the need to keep "purchased" feeds to a minimum. The advantage here however is that purchased feeds are all home grown therefore cost is as low as possible.

How do we approach this? The practice at Engsta is to separate the feeding strategy into two programs (with overlapping margins); summer feed and winter feed. This is based upon seasonal factors and milk payments.

Summer feed

Summer grazing must be within close proximity to the dairy and to shade because of the negative influence heat stress can have on milk production. It must also be cheapest to provide, as milk payments are significantly less during the summer. Therefore, summer pastures are primarily lucerne. For the purposes of reducing bloat risk, they are generally retired hay paddocks containing a certain percentage of summer grasses. We rely on these pastures supplying about 10 MJ ME/kg DM.

When putting these figures together, 18 kg DM pasture can supply 180 MJ ME/day. With pregnancy taking the energy requirements to 200 MJ ME/day, there is the need for supplements and/or improving the quality of pasture supplied for this level of production to be maintained.

The lucerne pastures are sown at 8-10 kg/ha preferably in April/May if the season allows, otherwise in August/September. Single Super at a rate of 120 kg/ha is applied with the seed. Given the now expanded role of our lucerne stands and the greater emphasis they will play over their 3-5 year life, the sowing rate will be increased to 12-15 kg/ha. This is working on the theory that a higher plant population under irrigation will be sustained with the increased yield returns expected. Seed cost would be no more than $27/ha over a 5 year period at 15 kg/ha, depending on variety.

Lucerne establishment cost in 1996 including seed and seed treatment, fertiliser, pre and post emergent chemical applications, was $169/ha plus fuel and labour. If this cost is spread over 5 years, it is reduced to $34/ha/yr (or $5.60/t DM assuming a 6t DM/ha availability for grazing). Given the earning potential from hay production based on 15 t/ha and $160/t, a gross income of $2400/ha/yr makes this cost seem insignificant.

No fertiliser is applied to these pastures at this point, we consider the cost-benefit relationship does not warrant the input. This is for a number of reasons, the dominant one being the encouragement of less beneficial summer grass growth, which in turn would necessitate herbicide use. So long as water is not a limiting factor, growth response is satisfactory during summer. Having said this, I suggest that we would be able to improve upon the current pasture production and utilisation with strategic use of fertiliser on good quality pastures, an exercise we intend to carry out when our pasture re-establishment program is static - a lot of our current lucerne pastures require renovation. Typical soils tests results are indicating phosphorous levels of 35 mg/kg (Colwell), potassium 290 mg/kg (Colwell) and sulphur 50 ppm (KCl).

The forage sorghum and forage pennisetum used to supplement the lucerne pastures in mid to late summer are expected to supply 10 MJ ME/kg DM. The cost difference between lucerne and these feed sources is significant in establishment and ongoing inputs of fertiliser.

Nutrifeed, at a rate of 12 kg/ha and Nectar, at 18 kg/ha were sown in mid December 1997; 150 kg/ha urea was applied at sowing. This is the second summer we have used Nutrifeed, the results each time have been very encouraging. The herd seems to find it very palatable as well as showing a noticeable increase in production whenever they are grazing it.

Establishment cost for 18 ha of forage in 1997/98 was $191/ha plus fuel and labour. Added to this is $69/ha, being the cost of topdressing twice with urea at 80 kg/ha, totalling $260/ha/yr. The bonus comes however in the 30 t DM/ha yield, equating to around $8/t DM.

Supplementary feed during summer months is from triticale and some lucerne hay (usually from late February as pasture growth and quality decreases). Triticale is grown on farm during winter months, with the aim to yield at least 5 t/ha with 12 MJ ME/kg and 16% crude protein. This is fed at 4

Table 3: Calculating cow energy requirements

The average daily requirement given current production levels for the herd (20 l/cow/day), their pasture intake (18 kg DM/day) and their maintenance needs (600 kg cow walking 2 km/day) is as follows:

Liveweight maintenance (600 kg)	70 MJ ME
Milk (5 MJ ME/litre)	100 MJ ME
Liveweight change (-0.5 kg/day)	-11 MJ ME
Pregnancy (5 - 9 months)	(6 to 35 MJ ME)
Activity (4% of maintenance/km)	6 MJ ME

This totals 180 MJ ME/day with a (range of 171 to 200 MJ ME/day)

Table 4: Summer feed establishment costs at 'Engsta'.

Lucerne establishment cost:	
Total	= $169/ha + fuel & labour
Over 5 years	= $34/ha/yr or $5.60/t DM
Forage sorghum and pennisetum establishment cost:	
Total	= $191/ha + fuel & labour
Fertiliser	= $39/ha
1 year production	= $260/ha/yr or $8.00/t DM

kg/day for high producing cows and 3 kg/day for lower producers.

At this point, it would be appropriate to add in the other variable costs including water, pumping electricity, agrichemical, labour and fuel, estimated at 6 cents/kg DM/day.

From these feed sources, the returns then need to be assessed as follows:

- 20 l/cow/day of milk at 4.0% butter fat requires a minimum of 180 MJ ME/day. This is sourced from 18 kg pasture DM/day.
- *Pasture* - Establishment cost of $5.60/t DM or $0.006/kg DM (excluding fuel and labour costs). For current production, pasture establishment costs $0.11/cow/day for one year of the pastures expected 5 year life, and continuing production costs approximately $1.08/cow/day. At an average of 21 cpl for summer price milk, this equates to 28% or 5.95 cpl of her daily summer production income.
- *Forage* - Establishment cost of $8/t DM or $0.008/kg (excluding fuel and labour costs). For current production, forage establishment costs $0.14/cow/day each year and daily production costs approximately $1.08/cow/day, which totals $1.22/cow/day At an average of 21 cpl for summer price milk, this equates to 29% or 6.1 cpl of her daily summer production income.

Winter Feed

Winter feed must have the highest possible energy levels with good growth activity in an effort to keep supplementary feeding to a minimum during these lower production months. It is also necessary to keep milk production at its highest possible level as winter milk price is at a premium.

From the months late March to April (in normal years), previously established perennial ryegrass is incorporated into the feed program. It is at this time we can normally expect a growth response from the water applied over summer to keep it green.

At optimum grazing (*ie.* early vegetative stage) quality rye pasture should provide at least 10 MJ ME/kg DM. This is readily achievable during the peak growth period of the varieties chosen. However during the lower growth periods, pasture assessment exercises carried out at grazing (determined by a balance of "bulk and quality"), show this is usually 9 MJ ME/kg DM.

This phase of pasture establishment will be a focal point during autumn/winter 1998 (more details will be available by July).

Table 5: Summer feed cost summary

	Cost/cow/day	Cost/litre of milk
Pasture	$1.19	5.95 ¢
Forage	$1.22	6.1 ¢

During late April 1997, 5 ha of a rye mix was established as a trial run and introduction to gauging the potential from a ryegrass pasture under our conditions, especially its ability to return from the hot dry summer. A mix of Embassy perennial (14 kg/ha), Greenstone Hybrid (4 kg/ha), Demand white clover (4 kg/ha) and Pac19 red clover (2 kg/ha) was planted. Climatic conditions were very harsh during the establishment period, we incurred many heavy frosts and very little rain, which meant irrigation, was necessary. Flood irrigation on emergent and seedling pasture with frosts is certainly not ideal, however it did develop into a very useful pasture at the expense of the clovers.

A review of this pasture has led us this year to try rye grass alone, without any clovers, nitrogen needs to be met with applications of urea. One difficulty that became obvious by having a mixture of legumes and grasses was with weed control, the majority of herbicides suitable for use on broadleaf weeds are not registered for use on young legumes (*eg.* 2,4-D amine, MCPA). Similarly, herbicides suitable for use on legumes are not safe to use on grasses (*eg.* Treflan).

Forage oats becomes the primary source of feed during the winter months. The area available for oats can be increased to include paddocks further distanced from the dairy as heat stress and shade are not considerations. When direct drilled into the summer lucerne pastures, rates from 80 kg/ha to 120 kg/ha are used depending upon the density of the lucerne stand. DAP at 150 kg/ha is sown with the oats.

In 1997, more expensive specialist forage varieties were sown. When compared to the yields from the cheaper Yarran crops sown previously for beef cattle grazing, there appeared to be no significant advantage for the increased expense. For this reason Yarran was used extensively this year, planted in stages from early March to late April.

Forage oats have similar energy levels to the forage pennisetum used in summer and would be expected to yield at least 10-15 t DM/ha. At $176/ha for seed and fertiliser (including topdressing), this equates to $11.70/t DM or $0.012/kg DM.

For the purpose of this exercise, $0.06/kg DM will be used for the other variable costs such as labour, electricity and water (as for the summer feed calculations earlier). However, in reality one would expect that in most winters this figure would be lower as there would be less irrigation required.

Assuming an average production of 20 l/cow/day at 4.0% butter fat requiring 180 MJ ME/day sourced from 18 kg pasture and 4 kg triticale:

- For the targeted level of production, establishment costs $0.22/cow/day each winter for oats, added to this is the ongoing production/variable costs of $1.08/cow/day gives a total of $1.30/cow/day.
- At an average of 31 cpl for winter price milk, this equates to 21% or 6.5 cpl of her daily winter production income.

In reality mid winter pasture growth is noticeably lower, the bulk of growth occurring in spring. For this reason a substantial amount of lucerne hay, produced on farm during summer, is supplemented according to weather conditions and daily milk production. Production costs for 9 months to March 1998 indicate this hay is supplied at $59.30/t DM.

Approximating daily consumption at 7-10 kg/cow/day (6 - 8.5 kg DM/cow/day) results in a daily cost of $0.50/cow[B] or 2.5 cpl. If this is compared to hay actually purchased at $160/t ($136/t DM), the daily cost would be $1.16/cow 5.8 cpl.

This hay is regularly analysed for nutritional composition, consistently providing 10.5 MJ ME/kg DM, 21-25% crude protein and 68-70% digestible dry matter (DDM). When using the above feeding rate, 89 MJ ME/kg DM/day would be supplied. If it became necessary to completely supplement hay for the normal pasture contribution of energy, 16 kg DM/cow would be required at a 'homegrown' cost of 5 cpl/day or a 'commercial' cost of 11 cpl/day.

Conclusion

During exercises such as this, some key points become evident. Firstly, there is more to growing productive pasture than seed and fertiliser. It is important we continue to develop the skills necessary to assess and manage the pastures. Having valuable land tied up with an unproductive pasture is not only inefficient but also reduces the potential production of each cow, directly affecting our income and growth.

Secondly, with moves toward lowering the cost of production, pasture becomes the key. Resources with significant potential utilising pasture base feeding with technology require the necessary attention to ensure maximum benefit towards cost effective production.

Having a flexible approach to the daily management of the inputs is necessary, giving consideration to seasonal and outside influences. This is provided that the ultimate aim for high energy pastures for maximum cost effective milk production is the priority.

[A] Refer to Appendix 1

[B] $59.30/1000 kg DM = $0.0593/kg DM @8.5 kg DM/day = $0.50/cow/day

References

Whitson, C. (1997) Pastures - are you getting enough. *In* "Profit from pastures." C. Whiston, R. Itzstein and W. Faulkinson. Queensland Department of Primary Industries.

Appendix 1

Pasture required/utilised	
22001.5 kg butter fat x 25 kg	= 550 t/65 ha
(1)	= 7.9 t/ha
Feed supplemented	
80 t hay @ 15% moisture	= 68 t DM
110 t barley @ 14% moisture	= 95 t DM
	= 63 t DM/65ha
(2)	= 2.3 t DM/ha
Net pasture (1) - (2)	≡6.0 t DM/ha
	= 6,000 kg DM/ha
at 10 MJ ME/kg DM	= 60,000 MJ ME/ha
60,000 MJ ME/ha x 65 ha	= 3,900,000 MJ ME
for 150 cows	= 26,000 MJ ME/cow
at daily requirement of 153 MJ	
for 300 days	= 45,900 MJ ME/cow/yr

Means 19,900 MJ is required from supplement to produce 20 l/cow/day @ 4% butter fat or, is enough to produce 8 l/cow/day @ 3.5% butter fat.