Feed Conversion Efficiency in Pasture-based Dairying as Influenced by Stage of Lactation and Level of Feeding

J.G.M. Wientjes[A], W.J. Wales[A] and C. Grainger[B]

[A]Department of Primary Industries, Future Farming Systems Research, Kyabram Centre, Kyabram Vic. 3620
[B]Department of Primary Industries, Future Farming Systems Research, Ellinbank Centre, Ellinbank Vic. 3821

An experiment was conducted to explore nutrition regimes to optimise feed conversion efficiency (FCE; ratio of energy in milk and total energy from feed) of cows in pasture-based dairy systems. Two factors that may affect FCE are stage of lactation and level of feeding (Beever and Doyle 2007). The hypotheses tested were that FCE would be similar in early and mid-late lactation providing the contribution from body tissue changes was accounted for, and that FCE would increase with level of feeding.

A group of 30 cows, that calved in July and August 2006, were assigned randomly to 1 of 3 feeding levels (160, 188 or 215 MJ metabolisable energy (ME)/day) fed in individual pens during 4-week periods in spring (≈60 days into lactation) and autumn (≈200 days into lactation). The control diet in spring was comprised of 15 kg DM of cut pasture (ryegrass and white clover), and in autumn it was comprised of 6 kg DM lucerne hay and 7.5 kg DM ryegrass silage. The diets fed to cows in treatments 1 and 2 were the control diet plus 2.5 and 5.0 kg DM grain, respectively. The milk yield of each cow was measured daily and weekly p.m./a.m. composite milk samples were analysed for concentrations of fat, protein, and lactose using an infrared milk analyser. Cows were weighed once a week during the treatment periods. Intakes of all feeds were measured each day, and samples were bulked on a weekly basis and analysed for DM digestibility, crude protein and neutral detergent fibre using near-infrared spectroscopy. Data were statistically analysed by a 2-factor analysis of variance, with treatment and stage of lactation as factors, using Genstat 10. Corrections in FCE were made for energy available from tissue mobilisation and energy required for tissue replenishment at the individual cow level according to Australian standards of energy utilisation, based on changes in live weight of the cows during the treatment periods.

Table 1. Milk yield, feed intake (raw and adjusted for body tissue mobilisation (live weight loss) or replenishment (live weight gain)) and adjusted feed conversion efficiency (Ad FCE) in spring (60 days in lactation) and autumn (200 days in lactation) for control (160 MJ metabolisable energy (ME)/day), treatment 1 (188 MJ ME/day) and treatment 2 (215 MJ ME/day) cows

		Raw milk yield (MJ ME/day)	Raw feed intake (MJ ME/day)	Adjusted milk yield (MJ ME/day)	Adjusted feed intake (MJ ME/day)	Ad FCE (MJ ME milk/MJ ME intake)
Spring	Control	120	176	96	172	0.56
	Treatment 1	147	204	125	199	0.64
	Treatment 2	150	228	148	207	0.73
Autumn	Control	62	148	60	140	0.42
	Treatment 1	92	172	85	162	0.53
	Treatment 2	109	200	109	166	0.66

Adjusted FCE decreased ($P < 0.05$) with stage of lactation, indicating that an increasing part of the absorbed energy was partitioned towards processes other than milk production, thereby not supporting the first hypothesis. Adjusted FCE increased ($P < 0.05$) with increasing level of feed intake, due to a dilution of maintenance requirements, in support of the second hypothesis. Although the immediate marginal milk response to grain supplementation was highest at a feeding level of 188 MJ ME/day, a feeding level of 215 MJ ME/day resulted in the highest FCE. At 215 MJ ME/day, cows were replenishing body tissue in early and mid-late lactation, whereas cows fed at 188 MJ ME/day were mobilising body tissue to support their milk production at both stages of lactation. The reasons for reduced feed efficiency in later lactation are unclear. Large variations in live weight change also existed between cows, which may indicate that variation in daily feed intake and differences in daily nutritive characteristics of the diet may have influenced estimated live weight change due to variations in gut fill.

Beever, D.E. and Doyle, P.T. (2007). *Aust. J. Exp. Agric.* **47**: 645.

Email: bill.wales@dpi.vic.gov.au