# TechNote 25

## Determine nutrient requirements

**IN THIS TECHNOTE**



In this resource, "late lactation" covers the period from approximately 200 days in milk (DIM) until dry off. For spring calving cows, this is from March through to June and focuses on the autumn period.

## 25.1 Determine energy requirements of a cow in late lactation

A dairy cow in late lactation requires energy to support

- maintenance,
- milk production,
- activity (walking and grazing),
- (BCS),
- pregnancy (when 12 weeks or less to calving).

Energy required for maintenance, milksolids production, BCS gain, activity and pregnancy can be calculated from the Tables 1 to 8 in TechNote 2. In addition, the DairyNZ FeedChecker or DairyNZ Facts & Figures can be used to calculate energy requirements.

An example of energy requirements for a late lactation cow is provided in Table 1.

The primary differences between energy requirements and partitioning, for cows in late lactation compared with early and mid lactation are that they produce less milk and gain more BCS (Figures 1 and 2).

**Q:** How much does a cow eat in late lactation?

**A:** A 500 kg cow producing 1.0 kg MS will be eating approximately 13.5 kg DM/day of an 11 ME diet (e.g. pasture plus pasture silage and /or PKE)

*Table 1. Daily requirements of a late-lactation 500 kg LWT Kiwi Cross cow, producing 1.0 kg MS, walking 2 km over rolling terrain, gaining 0.15 kg LWT/day, and eating a diet averaging 11.0 MJ ME/kg DM.*

| Requirement | MJ ME |
|---|---|
| Maintenance | 59 |
| Walking on rolling hills for 2 km (2 km x 3 MJ ME/km) | 6 |
| Milksolids (1.0 kg MS x 80 MJ ME/kg MS) | 80 |
| LWT gain (0.15 kg LWT x 50 MJ) | 7.5 |
| Total MJ ME at 11.0 ME | 152.5 |
| **Total kg DM eaten (152.5 / 11 MJ ME)** | **13.9 kg DM** |
| **Total kg DM offered (if utilisation is 90%)** | **15.4 kg DM** |

*Figure 1. Typical milk production change through lactation in a pasture-based system (adapted from Roche et al., 2006).*

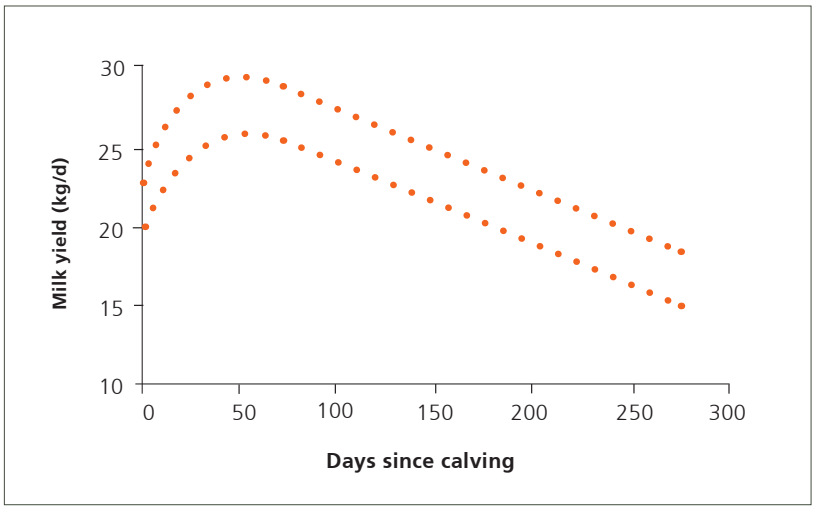
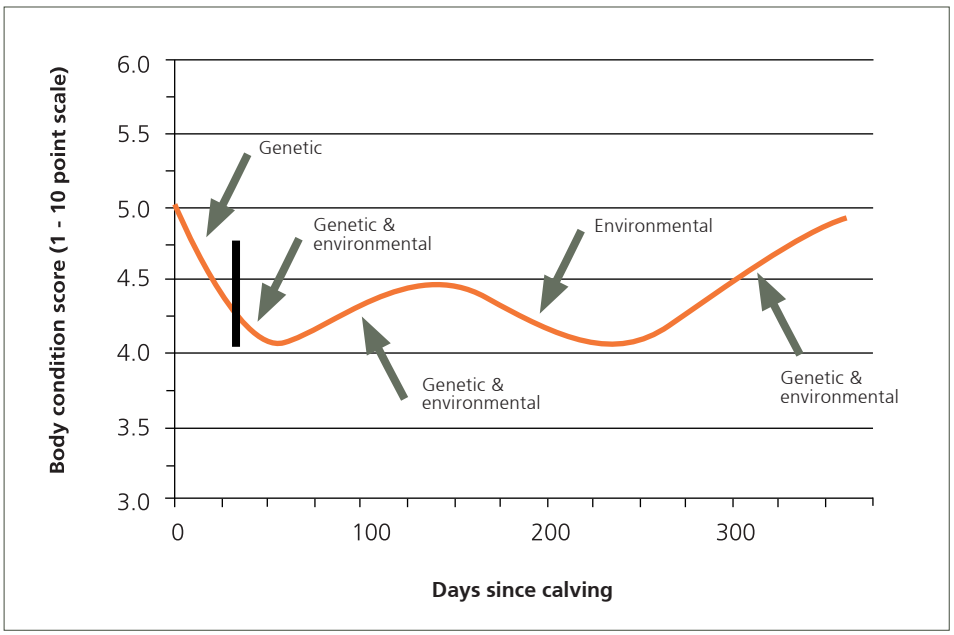



*Figure 2. Average body condition score change through lactation.*



## 25.2 Determine body condition score change and efficiency of gain

The "W" shaped curve in Figure 2 represents the body condition score (BCS) profile through-out a lactation in a pasture-based system and highlights the primary factor(s) that affect BCS change.

Late lactation represents a period of body condition gain. The amount of body condition gain during this period depends on both genetic and environmental factors. Higher producing cows will continue to partition more energy towards milk production and will therefore gain less BCS (and continue to produce more milk) through this period compared with lower producing cows.

However, even in lower producing cows, there is less BCS gain during late lactation compared with the non-lactating (dry) period. This is because although cows may use energy more efficiently for BCS gain while lactating, they have greater energy demands for milk production, maintenance and activity (grazing, walking) than when they are dry.

*For more details see TechNotes 27: Achieve body condition score targets at calving, and 30: Measure and monitor body condition score.*

## 25.3 Understand the impacts of reduced milking frequency

Reducing milking frequency to once a day (OAD) or 3 milkings in 2 days is a strategy that can be used during late lactation to help reach BCS targets. The effects of these two management strategies are detailed below.

### 25.3.1 Determine the effects of once a day (OAD) milking

In a research trial based in the Waikato, reducing milking frequency to OAD for 3 months during mid/late lactation reduced daily milk production by approximately 15%. As many farms have produced 60 – 70% of their season's production by this point, the impact on whole season production was much smaller (approximately 4-5% loss). Milking cows OAD during this period improved energy status and body condition score gain (Table 2).

There was only a minimal decline in dry matter intake during the period of OAD milking and a small reduction in feed required during the dry period to achieve target BCS gain.

In the trial there was a small impact of OAD milking on lactation length (7 extra DIM). Cows milked OAD were primarily dried off for low milk production; whereas cows milked twice a day tended to be dried off for low BCS. All cows were managed through the dry period to reach target BCS at calving, and there was no effect of milking cows OAD in late lactation on milk production the following season.

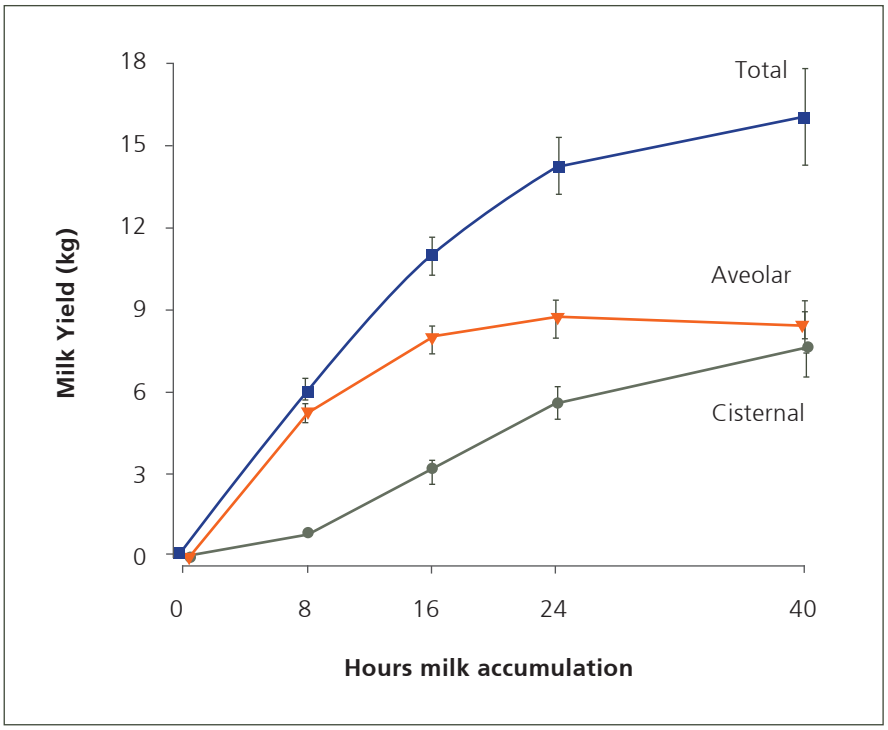
***Table 2.*** *Impact of milking cows OAD for 3 months in mid/late lactation (Feb – April).*

| Variable | Once a day | Twice a day | Difference (%) |
|---|---|---|---|
| **Milksolids (kg/cow)** | | | |
| **Daily during OAD milking** | 1.1 | 1.3 | ⬇ 10 -15% |
| **Daily during peak next season** | 2.3 | 2.3 | = |
| **Days in milk** | 285 days | 278 days | ⬆ 7 days |
| **BCS at dry off** | 4.4 | 4.2 | |
| **Total BCS gain for 12 weeks** | 0.45 BCS unit | 0.2 BCS unit | ⬆ 0.25 BCS unit |
| **Dry matter intake (kg DM)** | | | |
| **Daily during OAD period** | 16.8 kg DM/d | 17.2 kg DM/d | ⬇ 0.5 kg DM/d |
| **Required for BCS gain during dry period** | 123 kg DM | 160 kg DM | ⬇ 40 kg DM |

### 25.3.1 Determine the effects of 3 in 2 milking

There is limited research on the impact of 16 hour milking or milking 3 times in 3 days, on energy requirements, and subsequent milk production and BCS gain during late lactation. It is postulated that due to the mammary gland limiting negative feedback on milk secretion until after 16 hours of no milking, that there will be minimal, if any, impact on milk production (Figure 3). Extrapolating from this, would suggest that reduced energy requirements from 3 milkings in 2 days would be due to reduced energy spent walking to and from the shed and more time available for grazing. These may result in minor increases in energy status and BCS. Some of the advantages of 3 in 2 or 16 hour milking may be at a system level (e.g. pasture allocation using a 16 hour compared with 12 hour break can result in lengthening of the rotation and greater pasture growth; reduced heat stress from not walking/milking in the afternoon). However, more research is required in this area to determine the impact of 3 in 2 at a farm systems level.

***Figure 3.*** *Effect of milk accumulation in the mammary gland on milk production (Davis et al., 1998).*



## 25.4 Further reading

DairyNZ body condition scoring. The reference guide for New Zealand dairy farmers. www.dairynz.co.nz/publications/animal/lody-condition-scoring-reference-guide/

Davis, S. R., V. C. Farr, P. J. A. Copeman, V. R. Carruthers, C. H. Knight, and K. Stelwagen. 1998. Partitioning of milk accumulation between cisternal and alveolar compartments of the bovine udder: relationship to production loss during once daily milking. Journal of Dairy Research 65: 1 – 8.

Grala, T. M., R. R. Handley, J. R. Roche, C. G. Walker, C. V. C. Phyn, and J. K. Kay. 2015. Once-daily milking during late lactation in pasture-fed dairy cows has minor effects on feed intake, condition score gain and hepatic gene expression. Journal of Dairy Science 99: 3041 – 3055.

Kay, J. K., and C. V. C. Phyn. 2015. Once-a-day milking post Christmas. DairyNZ Inside Dairy December 2015: 14 – 15.

NRC. 2001. Nutrient requirements of dairy cattle (7th rev. ed). Washington, United States of America: National Academy Press.

Roche, J. R., D. P. Berry, and E. S. Kolver. 2006. Holstein-Friesian strain and feed effects on milk production, body weight, and body condition score profiles in grazing dairy cows. Journal of Dairy Science 89: 3532 – 3543.

Roche, J. R., N. C. Friggens, J. K. Kay, M. W. Fisher, K. J. Stafford and D. P. Berry. 2009. Invited review: Body condition score and its association with dairy cow productivity, health, and welfare. Journal of Dairy Science 92: 5769 – 5801.