

7

How feed requirements change during lactation

This chapter:

Explains the changes in energy requirements and intake capacity of cows at different stages of lactation.

The main point in this chapter:

- the partitioning of energy to milk production and body condition changes with the stage of lactation
- the stages of lactation can be categorised into early, mid- and late lactation and the dry period
- each stage has different goals and therefore required different feeding strategies.

Several changes occur in cows as they progress through different stages of lactation. As well as variations in milk production, there are changes in feed intake and body condition, and stage of pregnancy.

Following calving, a cow may start producing 10 L/d of milk, rise to a peak of 20 L/d by about seven weeks into lactation then gradually fall to 5 L/d by the end of lactation. Although her maintenance requirements will not vary, she will need more dietary energy and protein as milk production increases then less when production declines. However, to regain body condition in late lactation, she will require additional energy.

If a cow does not conceive, she has no need for additional energy or protein during pregnancy. Once she becomes pregnant she will need some extra energy and protein. However, the calf does not increase its size rapidly until the sixth month, at which time the nutrient requirement becomes significant. The calf doubles its size in the ninth month, so at that stage a considerable amount of feed is needed to sustain its growth.

Cows usually use their own body condition for about 12 weeks after calving, to provide energy in addition to that consumed. The energy released is used to produce

milk, allowing them to achieve higher peak production than would be possible from their diet alone. To do this, cows must have sufficient body condition available to lose, and therefore they must have put it on late in the previous lactation or during the dry period.

This chapter introduces the lactation cycle with its varying goals hence feeding strategies. Further chapters will enlarge on management to achieve these strategies.

7.1 Calving to peak lactation

Milk yield at the peak of lactation sets up the potential milk production for the year; one extra litre per day at the peak can produce an extra 200 L/cow over the entire lactation. The full lactation response to extra milk at peak yield varies greatly with feeding management during mid- and late lactation. There are several obstacles to feeding the herd well in early lactation to maximise the peak. The foremost of these is voluntary food intake.

At calving, appetite is only about 50% to 70% of the maximum at peak intake. This is because during the dry period, the growing calf takes up space, reducing rumen volume and the density and size of rumen papillae is reduced. After calving, it takes time for the rumen to 'stretch' and the papillae to regrow. It is not until weeks 10 to 12 that appetite reaches its full potential.

If the forage is very moist, say with a dry matter content of only 12% to 17%, the rumen cannot hold sufficient fresh forage to meet the dry matter (DM) needs of the cow. Peak milk production occurs around weeks 6 to 8 of lactation. So, when a cow should be gorging herself with energy, she is physically restricted in the amount she can eat. Figure 7.1 presents the interrelationships between feed intake, milk yield and live weight for a Friesian cow with a 12-month intercalving interval, hence a 300-day lactation. Such a lactation cycle is more typical of temperate dairy systems rather than small holder tropical ones. However, as it is possible in the tropics, it has been included in this manual as a target.

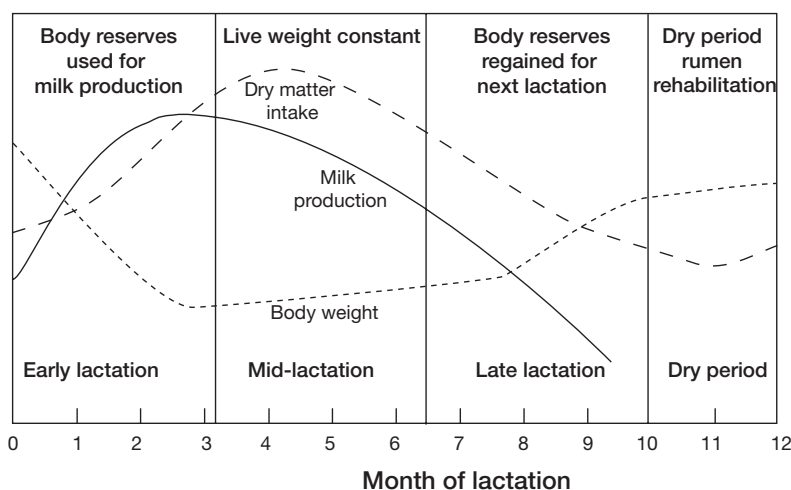


Figure 7.1 Dry matter intake, milk yield and live weight in a Friesian cow during the lactation cycle.

The level of feed intake is primarily determined by stage of lactation, but it can be manipulated. The feed intakes required for cows to meet their energy needs to produce target milk yields are shown in Table 7.1. By providing a high quality diet during early lactation (ie 10 versus 8 MJ/kg DM of ME), the physical restrictions of appetite would be reduced.

Table 7.1 Quantities of dry matter consumed by cows fed diets of different energy density and producing three levels of milk

Milk yield (L/d)	Daily energy requirement (MJ ME)	Daily required intake (kg DM)	
		8 MJ/kg DM	10 MJ/kg DM
13	125	15.6	12.5
17	146	18.2	14.6
20	161	20.1	16.1

The 20 L/d cow could probably not eat 20 kg DM of feed at 8 MJ/kg DM of Metabolisable Energy at any time during lactation, let alone in early lactation when intake is restricted. During early lactation, cows will produce more milk from more energy-dense feeds because they have to eat less DM to receive an equivalent intake of energy. Nutritional requirements generally exceed voluntary food intake until week 12, so body fat reserves are drawn upon to make up the nutrient deficit.

7.2 Peak lactation to peak intake

Following peak lactation, cows' appetites gradually increase until they can consume all the nutrients required for production, provided the diet is of high quality. Cows tend to maintain weight during this stage of their lactation (Figure 7.1).

7.3 Mid-lactation to late lactation

Although energy required for milk production is less demanding during this period because milk production is declining, energy is still important because of pregnancy and the need to build up body condition as an energy reserve for the next lactation.

It is generally more profitable to improve the condition of the herd in late lactation rather than in the dry period. While lactating, cows use energy more efficiently for weight gain (75% efficient compared to 59% efficient when dry).

7.4 Dry period

Maintaining (or increasing) body condition during the dry period is the key to ensuring cows have adequate body reserves for early lactation. Ideally, cows should calve in a condition score of at least 4.5, and preferably 4.5 to 5.5 (see Chapter 18 for details of scoring system). If cows calve with adequate body reserves, feeding management can plan for one condition score to be lost during the first two months of the next lactation.

Australian studies have found each condition score lost (between scores 3 to 6) in early lactation to be equivalent to 220 L of milk, 10 kg of milk fat and 6.5 kg of milk

protein over the entire lactation (Robins *et al.* 2003). Furthermore, each additional condition score at calving can reduce the time between calving and first heat by 5 to 6 days. The sooner the cow begins to cycle, the sooner she is likely to get into calf.

If cows calve in poor condition, milk production suffers in early lactation because body reserves are not available to contribute energy. Dietary energy can be channelled towards weight gain rather being made available from the desired weight loss. For this reason, high feeding levels in early lactation cannot make up for poor body condition at calving.