Dairy Australia

Designing balanced milker diets

Maximise milk income minus feed cost

A milker diet that is good for the herd's productivity and health plus the farm's bottom line is:

- Optimal for Milk Income minus Feed Cost
- Nutritionally balanced
- Within the cow's daily appetite limit
- Palatable

Having assessed your herd profile to set a realistic milk yield target based on cow type, body condition and stage of lactation, designing a milker diet is a 3-step process:

1 Calculate cow nutrient requirements

2 Select feeds

3 Formulate diet

Step 1 Calculate cow daily nutrient requirements

Cows require diets that contain enough nutrients for maintenance, pregnancy, activity, growth, reproduction and milk production.

Although water, energy, protein and fibre are the key nutrients when formulating diets, minerals and vitamins must not be ignored.

Factors which affect cow nutrient requirements include:

- Cow bodyweight and age
- Growth
- Stage of lactation
- Pregnancy
- Activity (walking and grazing)
- Changes in body condition
- Milk yield and composition
- Environmental conditions.

Step 2 Select feeds

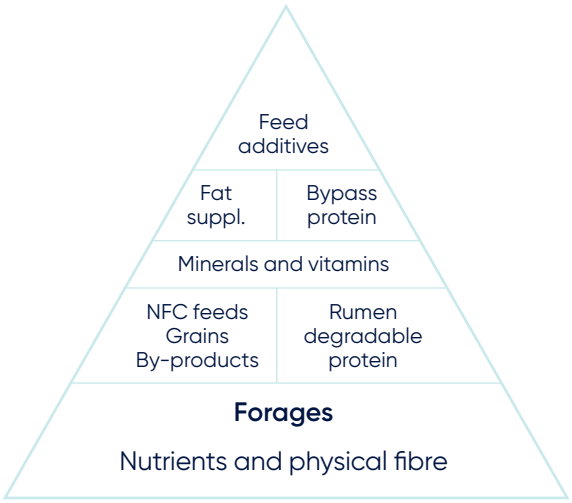
When selecting feeds to use in milker diets, factors to consider are:

- Nutrient specifications
- Price
- Consistency of supply and quality
- Losses to be expected during storage (shrinkage), mixing and feed-out
- Increased capital requirements required to handle
- Extra labour required to handle
- Other costs.

Feeds can vary markedly in their nutritive characteristics. Obtaining a feed test analysis is the best way to establish the nutritive characteristics of a feed.

As the feed pyramid illustrates, high forage quality is paramount when designing diets for milking dairy cows. Defined by its NDF% and NDF Digestibility values, forage quality has a substantial influence on feed intake. Forage quality drives the response to concentrates and diets.

Figure 1 Forage quality is paramount



Paulson, 2007

DELIVERING for DAIRY

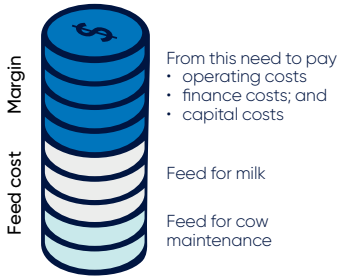
Step 3 Formulate diet

When formulating milking cow diets we follow a set of targets/guidelines such as these.

Table 1 Milking cow diet formulation targets/guidelines

Daily dry matter intake	3.5–4% of bodyweight
Crude protein	16–18% DM
Metab. energy	Positive balance (supply>demand)
Metab. protein	Positive balance (supply>demand)
NDF	30–35% DM
Effective NDF	>22% DM
Starch	22–27% DM
Starch and sugar	Max. 30% DM
Crude fat	Max. 6–7% DM total fats, of which max. 5% DM is unprotected fats
Macro-minerals	Balance to requirements
Micro-minerals	Balance to requirements

Figure 2 Milk income



Three key things to focus on are:

- Forage NDF per cent and NDF digestibility
- Starch digestibility in the rumen
- Protein per cent and rumen degradability.

Excessive supply of nutrients may affect cow health, reduce feed conversion efficiency (kg of milk per kg of feed) and reduce milk income minus feed cost. On the other hand, underfeeding will impact performance and potentially cow health and fertility if severe.

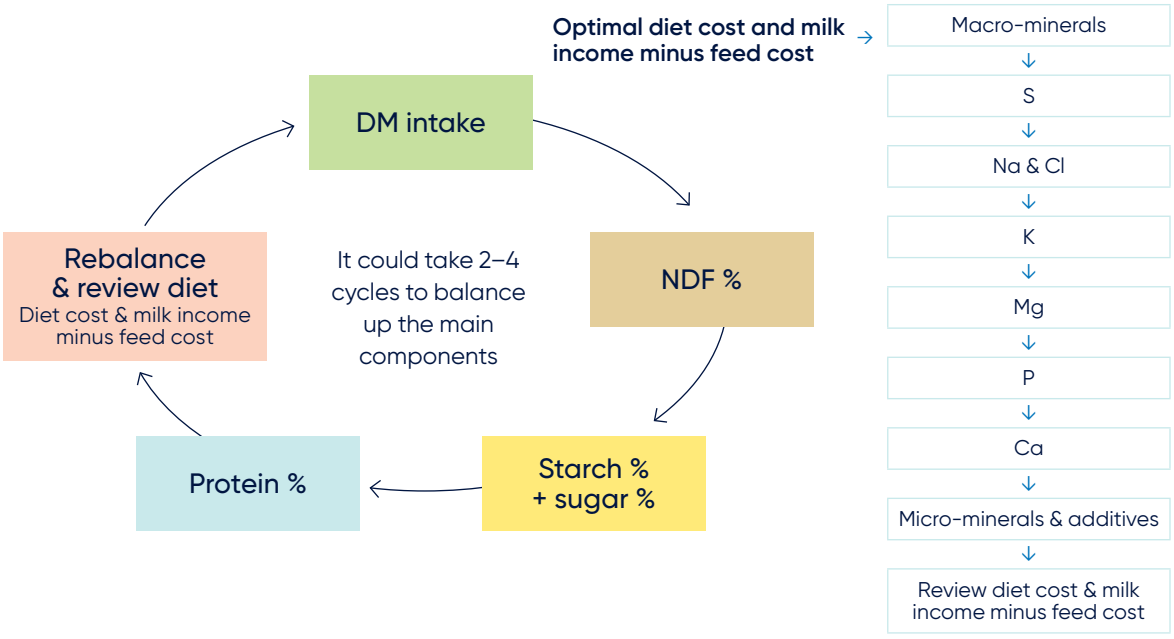
The diagram below describes the diet formulation process. As shown, it may take several cycles to balance up the main components of a diet and find a diet within the cow's appetite limit that gives the maximum possible milk income minus feed cost.

Maximising milk income minus feed cost

Milk income minus feed cost is a useful measure, particularly in circumstances where little or no pasture is available. It tells you how much of your milk income is left after paying for feed. This amount needs to pay for operating costs such as herd, shed, labour and overhead costs, plus your finance and capital costs, including drawings.

If you are feeding a significant amount of bought-in feed, you must achieve a high daily milk yield per cow to produce a greater milk income minus feed cost. The higher the milk yield, the smaller the percentage of unproductive money i.e. money spent on cow maintenance rather than producing milk and revenue.

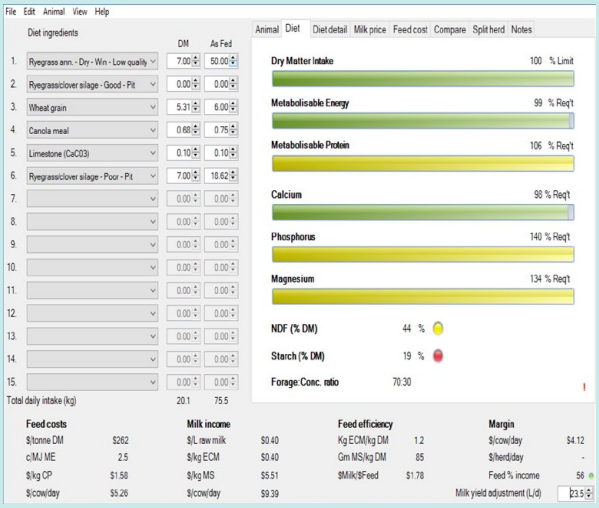
Figure 3 Diet formulation process



'Adapted from Hannah and Barber, 2007'

Nutrition models such as **Rumen8** make it relatively easy to:

- find a diet within the cow's appetite limit that gives the maximum possible milk income minus feed cost
- assess impacts of changing the inclusion rate, nutritional specification and/or cost of an ingredient on diet cost and milk income minus feed cost.



Let's have a look at how a cow's milk yield affects milk income minus feed cost, using a simple example:

We design a nutritionally balanced 30 litre diet using these five ingredients:

- vetch hay ($410/tDM)
- cereal silage ($250/tDM)
- wheat ($405/tDM)
- canola meal ($540/tDM)
- palm kernel extract ($320/tDM).

Assuming a milk price of 47.5 cents/litre, this diet generates milk income of $14.25/cow/day. Feed cost is $8.77, leaving a milk income minus feed cost of $5.48.

Now let's compare this with the milk income minus feed cost for diets based on the same milk price and varying amounts of the same five ingredients to meet cow requirements for higher and lower milk yields/cow/day.

As you can see in this example, milk income minus feed cost is lower at lower milk yield levels (25 and 20 litres), and higher at 35 litres. This is because the non-productive feed costs (to meet the cow's maintenance nutrient requirements) are diluted at higher milk yields.

Milk yield per cow per day	Milk income per cow ($) assuming same fat % & protein %	Feed cost per cow/day ($)	Milk income minus feed cost per cow per day ($)
35 litres	16.63	9.81	6.82
30 litres	14.25	8.77	5.48
25 litres	11.88	7.72	4.16
20 litres	9.50	6.65	2.85

With some fine-tuning of a diet designed for a given milk yield by a professional nutritionist, a further increase in milk income minus feed cost may be achievable. If a further $0.25 per cow per day was obtained, for a herd of 300 cows that would be an extra $75 per day or over $2,250 per month!

Acknowledgement
Dairy Australia acknowledges the funding contribution of the Commonwealth Government for eligible research and development activities.

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5590.3 | Jul 2024