CHALLENGE NOTE 3E -

Assessing the Dairy Cow's Winter Diet

Managing high yielding cows to meet their energy intake requirements for peak milk production is a major challenge facing dairy farmers. Underfeeding dairy cows leads to excessive negative energy balance and subsequent fertility problems.

With feed costs representing approximately 50% of the variable costs of milk production, the aim of this *Challenge* Note is to highlight the importance of feeding cows cost effectively to maintain fertility, production and profitability.

Contents

Assessing the adequacy of the dairy cow's winter diet involves two main elements:

1) estimating the cows energy and protein requirements;
2) measuring the feeds supplied to the cow, as shown in Table 1.

Table 1: Information required to check the adequacy of the cows' diet.

Feeds supplied to the cow	Cow requirements
• Daily forage intake;	• Daily milk yield (from bulk/tank/ milk recording/ parlour/computer);
• Forage dry matter, energy;and protein content (from forage analysis);	• Cow liveweight (estimate)
• Daily concentrate intake;	
• Concentrate energy and protein content (feed company).	

Feeds Supplied to the Cow

The ease and accuracy by which dietary evaluation can be carried out depends on the feeding management systems used with the dairy herd. The ease by which the cows diet can be assessed is evaluated across a range of management systems in Table 2.

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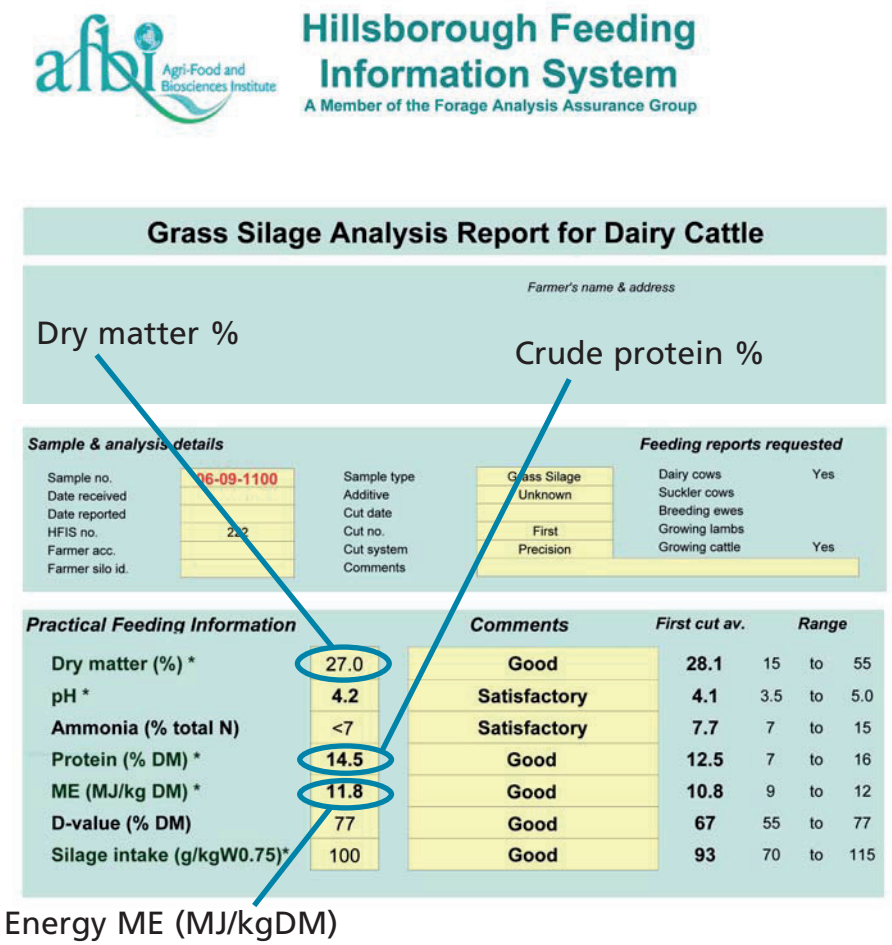
Table 2: Evaluation of dietary energy and protein intake in a range of management systems.

Feeding scenario	Grouped by stage of lactation	Method of assessing forage intake	Frequency of forage intake measurement	Ease of dietary intake assessment	Accuracy of intake assessment
1) Diet feeder	Yes	Weigh cells	Daily/weekly	Easy	High
2) Diet feeder	No	Weigh cells	Daily/weekly	Easy	Medium
3) Easy feeding	No	Forage block weights	Monthly	Labour intensive	Medium



Forages fed to the cow:
Forage data including dry matter, energy and crude protein values can be taken straight from the forage analysis sheet. It is advisable that forage is analysed more than once during the winter, to allow changes in forage quality, which do occur, to be taken account of.

Concentrates fed to the cow:
For concentrates the Metabolisable Energy (ME) and Crude Protein (CP) content of the diet should be quoted by the supplier.
Note: Crude Protein of concentrates will be quoted on an as fed basis, which needs to be converted to a dry matter basis as shown.

Concentrate Crude Protein to Dry Matter Conversion (as fed to the cow)

CP% = CP% (as fed) x 100
Conc. DM%

Most concentrates will have a dry matter content of ~ 87%

Concentrate fed to our example cow has 20% CP, and 11.6 MJ/kg fresh weight of ME as fed:

Crude Protein % = (20/87) x 100 = 23% on dry matter basis
ME (MJ/kgDM) = (11.6/87) x 100 = 13.3 MJ/kgDM

Figure 1: Example of silage analysis.

Scenario 1: Grouped by stage of lactation and fed with a diet wagon.

In large herd situations where cows are grouped according to stage of lactation and fed through a diet feeding system, daily forage and feed intake data can be easily collected and analysed on a weekly basis to evaluate the adequacy of the cows diet for energy and protein. Dietary analysis in this management situation will be very accurate giving the farmer a high degree of control over the cow's diet. Worksheets are provided as part of the *Dairy Herd Fertility Challenge* to use the raw data from these feeding management systems to calculate the cow's energy balance.

Scenario 2: Fed with a diet wagon, but NOT grouped by stage of lactation.

In herds where a diet feeder is used, but cows are not grouped according to stage of lactation, average forage intake can be easily and accurately measured. However, because the cow's appetite is lower in early lactation and concentrate feeding levels are higher, the average forage intake measured across the herd will over-estimate the forage intake of cows in early lactation. The average forage intake figure should therefore be adjusted downwards by 5% before being used to assess the adequacy of the fresh calved cows diet.

Scenario 3: Easy feed system.

In easy feeding systems, where individual blocks of silage are placed in the feed passage, measurement of forage intake will inevitably be less frequent and more labour intensive. Weighbridges, or weigh cells on loading shovels/tractor front end loaders with digital cab readouts are required to measure the weight of blocks of silage. The accuracy of the dietary intake assessment will again depend on whether cows are grouped according to stage of lactation.

Cow requirements

Cows eat to live, breathe and move around (a term known as **Maintenance**) and also to **Produce** (milk and calves). Therefore, the nutritional requirement of a dairy cow is calculated by adding the needs for maintenance and production together as seen in Figure 2.

Requirement = Maintenance + Production

Example cow
Early lactation cow
Liveweight of ~650kg
Produces 40 litres/day

Figure 2: Cow requirements.

Using the figures for this cow, it is possible to calculate the energy requirement of an individual cow, and check this against the diet supplied. This process can also be applied to a group situation through using group average figures.

Energy for maintenance: For the cow to live, breathe and move around she needs energy. This is known as **Maintenance** and is dependant on the liveweight of the cow. Values for a range of liveweights are given in Table 3.

Table 3: Maintenance requirement (MJ/day) for cows of varying liveweight.

Liveweight (kg)	Maintenance Req. (MJ/day)
550	64
600	69
650	74
700	79
750	84

Energy for production: As a general rule, each litre of milk produced requires **5MJ** of energy (but this figure can vary according to the fat and protein content of the milk).

Our example cow produces 40 litres/day so her production requirement is:
40 litres x 5MJ/litre = 200MJ/day

Protein requirement: The cows' protein requirement varies with stage of lactation as shown in Table 4. The balance between energy and protein is also important, as energy is required to break down excess protein.

Table 4: Targets for total diet crude protein % through lactation.

Stage of lactation	Target diet CP%
Early	17 – 18
Mid	16 – 17
Late	15 – 16

Total cow requirement:

Energy

Requirement = Maintenance + Production
= 74 + 200
= **274 MJ/day**

Protein

For a cow in early lactation, the target dietary crude protein % is:

17-18% crude protein

Diet Evaluation

To assess the cows' overall diet, feed inputs and the cows' energy and protein requirements can be entered into a diet evaluation worksheet (see Worksheet 3C: Energy and Protein Requirements). This worksheet can be used to evaluate the diet of:

1) An individual cow;
2) A group of cows at the same stage of lactation, for example, TMR systems;
3) A group of cows within a herd where the herd average forage intake is adjusted to allow for lower intakes in early lactation.

This worksheet indicates whether or not farmers are meeting the energy and protein needs of their cows. Several key areas can be examined from this worksheet.

- **Dry matter intake** - this is a key figure in diet evaluation. If cows are not eating enough, they cannot consume the energy and protein required to sustain milk production.
- **Energy balance** - this measures the adequacy of the ration for production, and is generally shown as liveweight change, that is, if cows are losing or gaining excess weight the ration is not balanced for energy, or dry matter intake is not adequate.
- **Negative energy balance** - cows in early lactation will almost certainly be in negative energy balance, as intake cannot meet production demands for the first few weeks. It is important that this period is minimised to ensure that cows do not lose excess condition, as this could adversely affect fertility.
- **Liveweight change** - cows in early lactation should lose no more than 0.5kg/day, and later in lactation should be at least maintaining if not gaining condition to ensure that they are dried off at the correct condition score.

Summary

- Simple dietary assessment can be conducted using readily available information.
- Information on dietary constituents is available from feed companies and through forage analysis.
- Information on cow requirements can be calculated from liveweight and daily yield.
- Forage and concentrate feed intakes can be measured from diet feeder weigh cells, weigh bridges, weigh cells on loading shovels/tractor front end loaders and from parlour feeding equipment.
- The information can be used in Fertility Challenge Worksheet 3C to assess the adequacy of the ration for groups of cows.
- Farmers can then make adjustments to the feeding ration to maintain production, cow condition and herd fertility performance.

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