Fodder beet – feeding to dairy cows (1-73)

Summary

- Transition cows carefully onto crop over a 10 to 14 day period.
- Fodder beet requires more attention to feeding management than kale and swedes.
- Crop DM measurement needs to be accurate, most particularly during transition on to the crop; know the actual DM % of your fodder beet crop.
- Graze the roots and tops together.
- In order to gain 0.5 BCS over 6 weeks, a 480 kg dry cow needs to be consuming 130 MJME/day. The crude protein content of the diet should be at least 13% and fodder beet should not exceed 2/3 of the diet.
- Metabolic issues generally presenting in late dry period or early lactation caused by phosphate deficiency in fodder beet diets.

Introduction

Fodder beet, whilst having been grown in New Zealand for many years, has only recently gained popularity as an important part of dairy cow winter feeding systems. With increasing use we are getting a better understanding of the issues associated with feeding this crop. The key to successful use of fodder beet for dry cow grazing is to follow good practice and not cut corners. This applies throughout the process from seedbed preparation to sowing, weed and pest control and allocating a balanced diet to the cows. Good practice is most critical during the 10 -14 days of transition onto the crop, when rumen acidosis risk is high.

It is necessary to ask for advice and gain experience in growing and feeding this crop. There will be variations between sites and soil types that may affect such aspects as phosphorous and calcium content, with consequent repercussions in the performance of cows on the crop and in their subsequent lactation. Choose the variety of fodder beet you use wisely as varieties vary in their dry matter percentage and the proportion of the root above ground. Feeding management needs to account for these characteristics.

Fodder beet differs in many ways to kale and swedes therefore different feeding strategies are required. Average nutrient concentrations for commonly used winter forages are provided in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>DM%</th>
<th>Crude Protein%</th>
<th>NDF%</th>
<th>WSC g/kgDM</th>
<th>MJME/kgDM ME/</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fodder beet average</strong></td>
<td>14 - 20</td>
<td>9 - 14</td>
<td>11 - 16</td>
<td>500 - 700</td>
<td>12 - 12-5</td>
</tr>
<tr>
<td><strong>Beet leaves (tops)</strong></td>
<td>12 - 13</td>
<td>19 - 23</td>
<td>30</td>
<td>100 - 120</td>
<td>11.0</td>
</tr>
<tr>
<td><strong>Beet roots Low DM</strong></td>
<td>10 - 13</td>
<td>9 - 11</td>
<td>15 - 13</td>
<td>650</td>
<td>11.8 – 13&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Beet roots High DM</strong></td>
<td>15 - 18</td>
<td>15 - 20</td>
<td>10</td>
<td>11 - 11</td>
<td>700</td>
</tr>
<tr>
<td><strong>Swedes</strong></td>
<td>9 - 12</td>
<td>12 - 20</td>
<td>16 - 30</td>
<td>450 - 500</td>
<td>11 - 13&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Kale</strong></td>
<td>11 - 15</td>
<td>12 - 18</td>
<td>20 - 35</td>
<td>350 - 400</td>
<td>11.0 - 12.5</td>
</tr>
</tbody>
</table>

<sup>1</sup> Be aware that feed test evaluations may indicate higher ME than this range, but in practice the crop may not feed at that level.

Updated May 2013
Feeding practice for fodder beet

To avoid nutritional disorders e.g. rumen acidosis and to minimize body condition loss during the change to crop feeding it is essential to transition cows onto the crop correctly. Slowly introduce the cows to fodder beet by decreasing the proportion of pasture/silage and increasing the amount of fodder beet in the diet over a 10 – 14 day period, starting with 2kg DM fodder beet per cow per day. At the beginning it is necessary to make enough room for all cows in the mob to get on the crop - without over allocating. For animals new to fodder beet transitioning may require the beets to be chopped or smashed to get the cows to try them. Controlling cow intake by limiting time on crop is not recommended as a tactic for transition. It may be necessary to drop a fence to give cows access to a long narrow face, or to lift some beet. It is unrealistic to expect cows to adjust from a milking cow diet to consuming the final allocation of fodder beet in one day; the rumen must undergo big changes in order to safely handle feed of the quality of fodder beet. Ensure sufficient silage and/or pasture and straw to meet cow energy requirements during this 10-14 day period. Ensure a good gut fill when cows enter the crop to slow the rate of intake. During transition check that cows are eating everything allocated to them, do not let a bank of uneaten fodder beet accumulate. It is important to remember that individual cows will transition at different rates so even with well-planned transitioning acidosis can occur.

Substantial differences in feed composition between roots and tops (leaves) necessitate careful crop allocation. Roots have very high WSC [water soluble carbohydrates] but very low NDF [fibre] and crude protein (CP; table 1). On average 25% of the dry matter (DM) of the crop is in the tops.

By grazing tops and roots together it is possible to largely overcome the CP deficiency of the root. This is achieved by allocating daily breaks which ensure that cows eat tops and roots on the same day. This needs some monitoring as the proportion of leaf in the crop can change through the season. Depending on the total yield and therefore the ratio of root to tops in individual crops the total crop CP level may not meet the 12% - 14% CP requirements for dry cows. This is particularly relevant for 30T plus crops where the top proportion of the total yield may be lower than 25%. Cereal straw is not recommended as a sole fibre source for feeding with fodder beet due to its low CP content. Inadequate protein intake during the dry period can negatively affect appetite and potentially MS production in the following lactation.

If you are feeding lifted beet [no tops], you will have to replace the protein from another source [see Table 2].

To quickly work out the yield of a fodder beet crop

The critical part of the paddock to get a good yield estimate of is the part which will be fed over the first 2 weeks because getting allocation right during transition relies on an accurate yield estimate.

Dry Matter yield

1. Pull all the beets from at least 3 different 4 metre long sections of rows in the crop, chosen as a representative sample of the crop which the cows will eat first.

2. Clean any dirt off the roots; cut the tops off and weigh the roots and tops separately

3. Find the average weight per running metre of row for roots and average weight per metre for tops and multiply these numbers by 20,000 [in the case of a 50cm row spacing or by 22,222 in the case of a 45cm row spacing] to get a kg/ha wet weight for roots and one for tops

4. Send a representative sample of roots and tops away for DM determination [a sample bag with instructions should be available from your rural supply store]. Cut an “average – representative” root into quarters lengthwise and seal in a plastic bag to minimise moisture loss. Check with your lab, they may want you to weigh the sample before sending it in.
5. Multiply the wet weight kg/ha [step 3] of the roots and tops by their respective DM percentages, add these 2 numbers together to get the kg DM/ha yield.

**Protein percentage**

1. Multiply the kg DM/ha yield for roots and tops by their different estimated crude protein percentage [if you have actual results from a lab then use them], add these together to get kg CP/ha

2. Divide kg CP/ha by the kg DM/ha to get the %CP for the crop, this number can then be used as a guide to ensure that protein inputs from pasture, silage, hay or straw are sufficient to meet the cows crude protein requirement.

**Table 2**

<table>
<thead>
<tr>
<th></th>
<th>Av Wet weight/ha from step 3</th>
<th>DM% from Lab</th>
<th>Kg DM/ha</th>
<th>Estimated crude protein %</th>
<th>Kg CP/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tops</td>
<td>44800</td>
<td>X 18</td>
<td>8064</td>
<td>X 19</td>
<td>1532</td>
</tr>
<tr>
<td>Roots</td>
<td>135200</td>
<td>X 11</td>
<td>14872</td>
<td>X 10.5</td>
<td>1547</td>
</tr>
<tr>
<td>Tops + roots</td>
<td>180000</td>
<td></td>
<td>22936</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: because of the large size of individual beets, there can be difficulty in getting a truly accurate estimate of kg DM/ha, therefore a conservative approach to feed allocation is recommended while you gain experience with this crop on your property

**Allocation**

The Winter Crop Allocation Calculator is a useful tool to help allocate crop and supplement, taking into consideration crop yield, paddock size and cow requirements. To use it, visit the Southern Wintering Systems page on the DairyNZ website. See the link below.

http://www.dairynz.co.nz/sws

Twice daily shifting of a long narrow break, feeding under the wire, is considered best practice for crop allocation. This promotes steady mixed consumption of roots and tops whilst maximising simultaneous access by cows and minimises crop wastage.

Break size is always critical to getting the right feeding levels but especially in high yielding crops. Prior to feeding, measure crop yield, determine the DM from analysis and calculate the paddock yield. Given the range in crop varieties and the top to root ratio variation between varieties, it is best to analyse for DM rather than using typical book values. If the fresh weight from 1 m² is 12 kg, calculations using the typical range of DM contents i.e. 14 to 20% would give yield estimates from 16.8 to 24 tonnes DM/hectare. This range in yield would have significant impacts on the area allocated and therefore the number of grazing days available. Errors with yield estimates, break size measurement, and number of cows are magnified with high yielding crops.
Feeding levels

A typical example of a diet for a moderate sized dry cow to achieve 0.5 body condition score gain during winter would be:

Table 3

<table>
<thead>
<tr>
<th>Feed</th>
<th>MJME/kg DM</th>
<th>Allocated kg</th>
<th>Utilisation %</th>
<th>MJME eaten</th>
<th>Kg DM eaten</th>
<th>CP%</th>
<th>CP eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fodder beet</td>
<td>12.4</td>
<td>8.9</td>
<td>0.9</td>
<td>99.2</td>
<td>8</td>
<td>12.0%</td>
<td>0.96</td>
</tr>
<tr>
<td>Pasture silage</td>
<td>10.5</td>
<td>4.4</td>
<td>0.8</td>
<td>36.75</td>
<td>3.5</td>
<td>17.0%</td>
<td>0.595</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13.3</td>
<td></td>
<td></td>
<td>135.95</td>
<td>11.5</td>
<td>13.5%</td>
<td>1.555</td>
</tr>
</tbody>
</table>

This diet meets both requirements of total ME intake at least 130 MJME per cow per day and a total diet crude protein content of more than 13%. There is a greater requirement for a fibre source when feeding fodder beet than is the case for brassica crops because of the low NDF and very high WSC in the roots. It is recommended that Fodder beet should not exceed 2/3 of the diet to avoid rumen acidosis.

It may be necessary to decrease or eliminate the use of straw in the diet, in favour of pasture silage if the CP% in the crop is too low. This is also dependent on the CP level of the fodder beet crop, hence the recommendation to get a feed analysis done on the fodder beet before feeding. Cereal silage is not well suited for feeding with fodder beet as it has low CP and contains moderate levels of non fibre carbohydrate (starch) which is already in abundance as WSC in fodder beet. Other diet formulations can be used to meet these requirements, such as using Lucerne silage which has a higher CP and may allow some use of straw in the combined diet.

Cow health

1. Rumen acidosis

Rumen acidosis is the primary risk given the high WSC and low (NDF <20%DM) fibre content of fodder beet roots. Clinical symptoms of acute rumen acidosis include: depression, dehydration, scouring, bloating, laminitis, rumenitis, milk fever or sudden death.

Often there are no specific clinical signs of rumen acidosis. Many cases of cows that “don’t do well” on fodder beet (empty gutted, condition loss), especially during the first 2-3 weeks of feeding are actually sub-clinical cases of rumen acidosis. Careful observation of all cows is necessary, should any cows appear unwell, they should be removed from the crop to pasture and the vet consulted promptly. The outlook for cows affected by clinical acidosis is not good, many will die later in the season: often presenting with signs such as liver abscess. By following good practice in transitioning cows onto the crop, feeding them regularly and providing adequate chewable fibre rumen acidosis can be avoided.

2. Metabolic issues

Phosphorous

While both bulb and leaf always have low P content, in some crops it is very low. Increased early lactation metabolic issues can occur after wintering on low P content beet crops, with ‘alert downer’ cows that respond poorly to treatment the common finding. This syndrome is associated with low P in the diet, and is successfully prevented by using 50g DiCalcium Phosphate (DCP) per cow daily across the winter, by applying it to the supplement. Discuss how this can be managed successfully with your vet, particularly regarding calcium metabolism around calving.
Oxalates

Oxalate levels in the tops may under some situations pose a potential risk to cows. Oxalates can bind calcium during digestion, forming insoluble calcium oxalate which passes out in the faeces and can result in cows suffering milk fever like symptoms. There are typically only a few cows affected in the first week or so of feeding, and there is no requirement to supplement Ca in typical use. It appears cows can tolerate the oxalate levels in fodder beet crops grown in New Zealand, so long as suitable transition on to the crop is carried out. After about 14 days transition, the rumen effectively detoxifies the oxalate in the diet.

Bloat and frosted crops

Most farmers know about the risks of grazing frosted crops. We do not entirely understand why cows are more likely to bloat on a frosted crop. Frosted plant cells may become more fragile and break down more quickly in the rumen. A more rapid breakdown of the plant cells means a more rapid fermentation in the rumen, more gas and acid production and a greater risk of bloat. Waiting for the frost to lift from the crop and feeding more fibre will reduce the risk of frost bloat.

DairyNZ acknowledges the valuable contributions made by PGG Wrightson, Agricom, Seed Force, farmers and Lincoln University [Animal Science] to the production of this Farmfact.