Feed Budgeting

Chicory

Chicory has started to be used in Dairy systems as a stand-alone forage crop for grazing between spring and the following autumn. Having a deep tap root Chicory has the ability to produce high quality feed over the summer months when other species are going reproductive and loosing feed quality. Using Chicory as a portion of a cow's diet over this period can maintain higher milk production compared to other summer pastures.

- **High quality summer forage**.
    - Very high production as a pure crop for milk production (16.7 t DM/ha from October – April, DairyNZ trial)
    - Very high quality feed source. ME 11.5 to 13.0 MJ ME/kg/DM and crude protein of 22% to 27%.
    - Boosts summer production/quality in mixes with grass and clover.
    - Quality silage (mix with low protein silage)
    - Can be used to mine effluent blocks (Potassium up-take).
    - 3.5 – 5 ha/100 cows required.
    - Up to 90% more milk/cow/day when on Chicory in research.
    - Farmers find a 2 -3 litre/cow lift in production.
    - Feed value of Chicory similar to summer turnips and is easy to grow and can produce more feed.
    - Milk production responses similar to (high quality) turnips, greatly improving Milk Solid production over pasture only diets.
    - DairyNZ work found that 17% more milk was produced when cows were fed 20% of their daily intake with Plantain or Chicory during summer when pasture quality was poor.

Feed Value		
	Perennial Ryegrass	Chicory
Fractional rumen degradation rate (hours for 50% breakdown)	6 hours	2.5 hours
Protein digestion efficiency (% protein not excreted)	61%	77%
Soluble sugars	7.4	11.1
Pectin (a readily fermented carbohydrate)	1%	10%
Structural carbohydrates (not readily fermented)	40%	15%
Ration of fermentable to structural carbohydrates	0.21	1.41
NDF	76	82
Digestibility	74%	82%
Crude Protein (N%)	16-20%	22-27%
Dry matter	15-18%	12-15%

Mineral analysis: chicory, perennial ryegrass and lucerne			
Element	**Chicory**	**Lucerne**	**Perennial ryegrass**
Zinc (ppm)	66–117	15–20	14–20
Copper (ppm)	13	7–10	6–7
Manganese (ppm)	210–400	50	50–300
Iron (ppm)	300	100	25–30
Magnesium (%)	0.28–0.44	1	0.16–0.20
Sulphur (%)	0.5	0.2–0.3	0.3
Phosphorus (%)	0.3–0.5	0.3	0.35–0.40
Calcium (%)	0.9–1.3	1.8–2.0	0.25–0.30
Potassium (%)	2.6–6.9	1	2.0–2.5

Source: NSW Department of Primary Industries, Reme Soils Goulburn and AgResearch New Zealand

Positives

- 40-50 days to first grazing.
- Drought tolerant once established.
- Can make up a proportion of the diet for 4-5 plus months.
- 14 to 25 day rotation (always high quality)
- No photosensitivity issues.
- No insect attack (once established).
- Average daily growth rate of 80 – 100 kg/DM/ha.
- Can be used for grass weed control before pasture renewal.
- Tap root = tolerance to Black Beetle and Grass Grub
- Tap root can be used to break hard soil pans.
- Increasing the supply of microbial protein to dairy cows through the summer and in silage to help maintain production.

- Reduced facial eczema risk due to lower spore levels and higher Zinc concentration in forage/diet

Negatives

- Crown damage to plants during wet weather can lead to plant disease and reduction in plant numbers.
- Disease in annual types (Ring spot / Sclerotinia) = reduced autumn yield.
- Reproductive stem development after first winter.
- No easy thistle control.

How to use Chicory on Dairy farms

- Plant Chico Chicory with Red and White Clover (6-8 kg/ha Chicory).
- Time of sowing, static 11-12°C soil temperatures.
- Sowing depth 10-12mm.
- Use a pre-emergent and then grass herbicides post-emergence for best results.
- Plant about 5 ha per 100 cows (this is to enable a portion of chicory in cows daily diet).
- First grazing at 7 true leaves.
- Graze at 20 cm on a 25-35 day rotation.
- Give cows one break of chicory each day.
- In most cases, chicory crops are over sown with ryegrass in the first autumn, but can be carried over for a second season.

Grazing management

- Spell after grazing until 3-4 leaves are fully emerged (about 25cm and 25-35 days)
- Strip graze to allocate as a portion of a cows total diet. (Use the feed budgeting equations to determine break fence area).
- Back fence after <3days.
- Apply N fertiliser to maximise production (amount and frequency depends on production required and environmental conditions. Keep build-up of nitrates in mind when making grazing plans).
- Avoid grazing when soils are very wet.

How to use chicory

- Straight stand
    - Chico Chicory 8kg/ha
- Mixed stand
    - Chico Chicory 6kg/ha

- Demand White Clover 2kg/ha
- Reaper Red Clover 2kg/ha

Chicory Summary

- Not difficult, just different.
- Focus on,
  - ✓ Weed elimination and control early.
  - ✓ Time of sowing, static 11-12°C soil temperatures.
  - ✓ Early post-emergence herbicide.
  - ✓ Accurate sowing depth.
  - ✓ Good seed soil contact for improved establishment.

Other calculations

- **What area of crop do I need for a specific time period? (above example)**

$$\frac{\text{Number of Stock}}{\text{(Total Yield kg X Utilisation \% / Total Daily animal intake) / \% of Diet fed of crop}} \times \text{Number of Days feed required} = \text{Area of crop required for a specific time period (ha)}$$

$$\frac{\text{(Total Yield kg X Utilisation \% / Total Daily animal intake) / \% of Diet fed of crop}}{\text{Number of specific days}} = \text{Number of stock per ha}$$

- **How many animals/ha so a paddock will last a specific time period?**

$$\frac{\text{Number of Stock}}{} = \text{Break Size (ha)}$$

Feed Budgeting Calculation

Example
A Dairy farmer requires a crop of summer turnips to supplement his 320 cow herd for 8 weeks beginning towards the end of December

1. Predicted yield = 8,000 kg DM/ha
2. Utilisation = 85%
3. Intake = 5kg DM/Cow/day

We can base our workings on the above information.
We expect little if any growth during the grazing of the crop (concurrent growth) and we expect no regrowth.

Order of calculation

1. Identify feed available (yield) X utilisation = DM Available for intake
   8,000 kg DM/ha X 85% utilisation = 6,800 kg DM/ha available
2. Identify demand, Intake/day X number of animals
   5kg/head X 320 head = 1600 kg DM/Day
3. Find out what one Ha will graze =Available yield for intake / herds daily requirement
   6,800 kg DM/ha / 1600 kg DM/day = 4.25 days day's grazing per hectare
4. Identify how many ha required to feed herd for 8 weeks (56 days) = day's / days grazing per ha
   56 days (8 weeks) / 4.25 days per ha = 13.2 ha of turnips are required to feed 320 cows 5 kg DM per head per day for 8 weeks.