

# CHOICE

## CHICORY GUIDE FOR DAIRY FARMS

Chicory is a perennial herb with a deep tap root, providing high forage quality and high warm-season drymatter production. **Choice** chicory has been thoroughly proven on farms, and in research, to substantially improve production both per animal and per hectare in dairy cows. It can be considered as a regrowth summer crop.

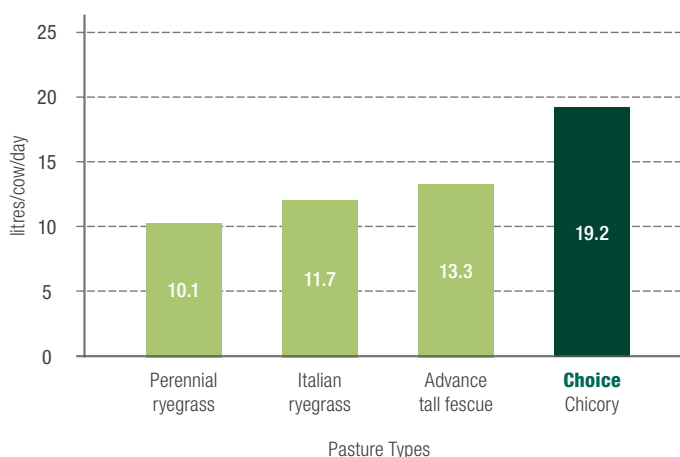
## Features of Choice Chicory

- High forage quality (protein and digestibility)
- Improves milk production
- High summer growth
- Slow winter growth in cold climates
- Good drought tolerance, deep tap root (1.5 m)
- Elevated mineral content (Zn, Cu, Mg, Ca, K)
- Reduced facial eczema spore levels
- Good grazing tolerance

## Performance of Chicory

A trial has shown that in a dry environment cows can produce up to 90% more milk when fed on **Choice** chicory relative to perennial ryegrass (Figure 1). In general, it is noted that dairy cow milk production responses from chicory are similar to those from turnips, improving milksolids production when supplementing pasture over the summer and/or autumn periods (Waugh *et al.*, 1998).

**Figure 1. Summer milk production from cows grazing four pasture types (Tharamaj *et al.* 2005).**



**Choice** chicory in dairy systems is typically used as a six month summer crop, as persistence of chicory into a second summer is often compromised by wet winters and heavy spring soils associated with many dairy environments.

Chicory's deep tap root, high drymatter growth rates and excellent regrowth potential in hot conditions makes it a versatile summer crop. **Choice** has the ability to continue to supply quality feed beyond the point when most summer turnips are finished; an important feature in a year with extended dry conditions. When pasture quality was poor (below 10 ME) feeding **Choice** at 20-40% of the diet can increase milksolids production by 17%<sup>1</sup>.

In a year with reasonable summer moisture, daily growth, rates of around 80-100 kg DM/ha/day can be expected during the summer/autumn.

<sup>1</sup> Lee & Minneé. (2012). DairyNZ Technical Series, August 2012. Chicory and plantain – your questions answered.



## Uses of Choice Chicory

There are three main ways that chicory is used.

### 1. MIXED WITH A GRASS/CLOVER PASTURE

This is the most common use of chicory because it requires very little change to pasture establishment and management practices. It is an easy way to increase animal production from a pasture. Seed is mixed at the rate of 1-4 kg/ha, depending on the content required. Establishment can be poor when mixed with high rates of perennial ryegrass, when sown in cold soils, or when planted too deep (>12 mm). Best results come from sowing with highly palatable grasses such as Italian ryegrass, Timothy, tall fescue or prairie grass.

#### SUGGESTED MIX:

CULTIVAR	Sowing Rate (kg/ha)
<b>Choice</b> chicory	4
<b>Asset</b> LE or <b>Asset</b> AR37	10
<b>Tribute</b> white clover	4
<b>Relish</b> or <b>Sensation</b> red clover	5
<b>TOTAL</b>	23



**Choice** chicory/fescue

### 2. AS A SPECIAL-PURPOSE CROP

This is often the best way to realise the benefits of chicory on a dairy farm because it provides a greater amount of high quality feed over summer. It also allows for selection of suitable soil types, and grazing management that is specific for chicory. Seed is sown at 6-8 kg/ha with or without white and red clover.

Over the last few years it has become common to plant chicory as a six month crop, however it is estimated that 20% of crops get taken through the winter into a second year. It is important to note that not all chicory will persist into a second year and cultivar selection is critical when making the decision to carry through.

#### SUGGESTED MIX:

CULTIVAR	Sowing Rate (kg/ha)
<b>Choice</b> chicory	6
<b>Tribute</b> white clover	2
<b>Relish</b> red clover	4
<b>TOTAL</b>	12



Specialist chicory stand

### 3. OVERSOWN INTO PASTURE

Good establishment can be achieved by spreading seed just prior to grazing in spring. This suits grass pastures planted in autumn without chicory which require thistle spraying in the first winter.



Chicory oversown into tall fescue

## Establishment of Choice Chicory

Chicory is more sensitive than ryegrass to sowing depth and soil temperature. It establishes best when sown into warm soils (12°C +) at 10 mm in depth, and where there are low amounts of competition from other plants during the first three months. Spring sowing is highly preferred, and late-autumn plantings should be avoided as the ideal time for first grazing from a mid March planting is mid June.

Weeds should be thoroughly eliminated before sowing because post establishment herbicides for chicory are limited. Some unregistered pre-emergence herbicides are used when establishing chicory without grass or plantain. Many weeds can be controlled in the early stages of establishment with Preside™ herbicide at recommended rates. Where it is expected that pastures will require a hormone spray after establishment, grass can be planted on its own with chicory (at least 3 kg/ha) and clover seed spread just before grazing in spring.

Soil fertility should be the same as required for ryegrass/clover pastures. Nitrogen fertiliser improves establishment of chicory, especially when temperatures allow for active growth.



Preside™ can be applied to young chicory seedlings

### EXAMPLE OF A GOOD ESTABLISHMENT PROGRAMME (GRASS TO PURE CHICORY)

1. Plan to plant chicory when soils are 12°C and rising, most likely to be late September/early October.
2. Spray out existing pasture with good rates of glyphosate + penetrant.
3. Wait for 5-8 days, mouldboard plough, roll furrows, power harrow to shallow depth.
4. Consider using a pre-emergent herbicide where necessary. Level and roll seedbed.
5. Apply establishment fertiliser – nitrogen (N) for rapid establishment, and phosphate and potassium for long term production.
6. Sow with a roller drill, light chain harrows, then final Cambridge roller. Seed must not be planted deeper than 12 mm (ideal is 10 mm).
7. Spray-irrigate to germinate if no rain after sowing.
8. Monitor weeds, and if found spray only with Preside™ (65 g/ha + Uptake oil). Apply when weeds are small (< \$2 coin) as it will not kill some large weeds, and it has a residual effect to control late-germinating weeds.
9. Apply N 3-4 weeks after planting, then after each grazing.
10. First graze whole paddock when plants have seven true leaves (crop will be about 25-30 cm high), leaving a 7-10 cm residual. If weeds are present, cutting with a mower will control most of the annual weeds.

Do not plant chicory within the withholding periods for residual hormone herbicides (e.g. Clopyraid, Tordon Max®, Dicamba) that may have been applied on previous crops. It is not advisable to plant chicory stands after brassica crops, as they may harbour and spread root diseases which can affect chicory.



## Management of Choice Chicory

Chicory is most productive and persistent when it is rotationally grazed, and spelled until 2-4 leaves/plant have fully re-grown (crop will have a mass of about 3000 kg DM/ha, or 15-20 cm height). Between spring and autumn this will mean a 21 to 35 day rotation.

In mid-spring (October) of the second season, chicory plants will develop a reproductive stem. This should be grazed off, close to the ground, while it is small (< 10 cm) and soft (see photo). A second grazing just two weeks later will reduce stem regrowth for the rest of the season.

Chicory is an extremely productive plant that is very responsive to large amounts of fertiliser. Its main requirement is nitrogen, and the clover in the sward will not be able to provide enough fixation for maximum chicory growth. Farms with specialist chicory pastures under irrigation are applying nitrogen (e.g. 60 kg/ha of urea) after every grazing, but for lower-input systems 2-4 applications of 80 kg/ha of urea over spring and early summer will be adequate for moderate carrying capacities. Phosphate, sulphur and potassium should be applied at maintenance rates that reflect the higher stocking rates (e.g. 200% of farm average).

Specialist stands of chicory without grass will tend to get winter annual grasses (e.g. *poa annua*) after 1-2 seasons. These can be controlled with grass-selective herbicides to improve spring production and persistence.



Stem should be grazed before it goes past this soft-stem stage.



Pre grazing of **Choice** chicory.



Post grazing of **Choice** chicory.

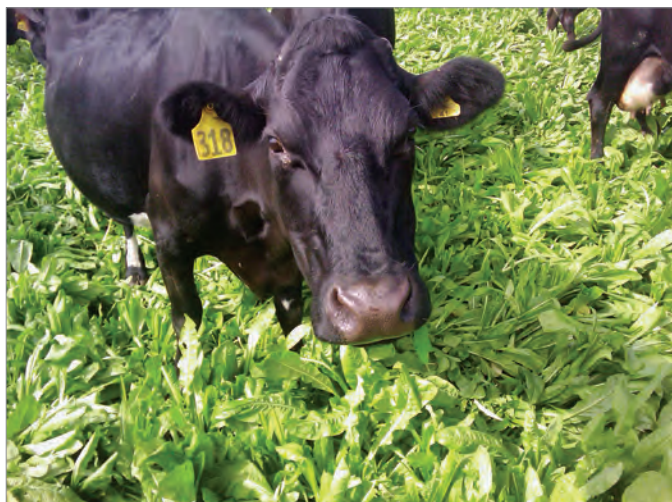
## Systems for Dairy Farms

The best system is to establish several paddocks of pure chicory/ clover pasture close to the dairy shed. To ensure a daily 3-hour diet of chicory, the amount of chicory pasture planted should be about 4-5 ha per 100 cows.

Grazing of whole paddocks may be required for the first 1-2 grazings while establishing the crop. Once well established, an area of chicory (about 0.3 ha per 100 cows) should be fenced off, and cows moved onto this break for 2-3 hours. Some farmers prefer to do this just before afternoon milking, as cows move quickly from their day (grass) paddock to the chicory (reducing walking time to the dairy shed), and it stimulates cow appetite when they would normally have a lower appetite on grass due to higher temperatures. Break fences are moved during the following day and the exercise is repeated. Back fencing is preferred to ensure good regrowth, but this can be impractical. If there are six paddocks of chicory on a farm, back fencing is not essential as strip grazing of each paddock is completed within two days, resulting in very little grazing of regrowth plants. If cows are in the paddock for more than three days, back fencing would be advisable to avoid grazing regrowth chicory.

This system provides a daily diet of chicory, which is important because it reduces any rumen adjustment needed if they switch from ryegrass to chicory part way through a rotation. In the first season, chicory crops can have very high digestibility and low fibre, and are therefore not suitable as a sole diet for cows.

Farmer experience has found per cow production can increase by two litres/cow or 10% per day from just a couple of hours of grazing chicory each day. They have also found that three hours of grazing chicory sustains cows as well as 12 hours on grass/ clover. Given the small land areas required, the per hectare profitability of this is very high.





## Red Clover

**Relish** red clover can be an important part of a chicory/clover crop, because white clover often struggles to compete against the growth of chicory. Without red clover, up to five applications of 100 kg urea/ha would be needed to make up for the lack of nitrogen fixation. While the red clover has potential to cause bloat, this does not occur very often because red clover is less prone to causing bloat than white clover and most of the daily diet is still chicory in this recommended system.

Chicory used in this method is effectively a regrowth substitute for summer turnips and boosts animal nutrition when it is lacking from pasture in summer. The advantages are that **Choice** chicory will last for 2-3 years from one planting (reduces costs) and it provides repeated grazings over more months of the year (September to May).



**Choice** chicory sown with clover.

## Seasonal Growth

**Choice** chicory will grow through winter, especially in the North Island, so will provide some grazing in early-spring, although not as much as ryegrass. To counter the slight reduction in early-spring carrying capacity, a crop rotation with Italian ryegrass can be used. For example, if a farm has six paddocks of chicory for grazing, two would be planted each year, and in their third autumn planted in Italian ryegrass.

This would mean that in each spring, the slower growth from four chicory paddocks will be balanced by the extra growth from two Italian ryegrass paddocks. An additional method to overcome this issue is to plant annual ryegrass in the autumn into paddocks identified for planting into their first crop of chicory in the following spring.



**Choice** chicory is palatable to cows, who will even eat leaf knocked to the ground, utilising about 90% of the crop at each grazing.

## Limitations

Chicory does not persist indefinitely, due to fungal root diseases slowly increasing in the soil. Typically chicory is used in unirrigated dairy regions that are often dry over the summer months, but still in high total rainfall zones with long periods of wet or humid soils. Persistence of chicory is poor on heavy and poorly-drained soils, especially when suffering pugging or crown damage.

Chicory is susceptible to thistle herbicides, so thistles need to be controlled before and after establishment by way of mowing, grubbing, spot spraying, or weed wiping.

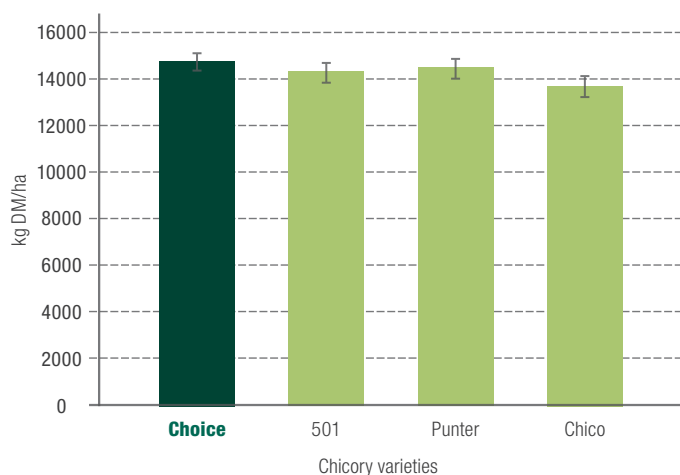
## Varieties of Chicory

Of the chicory varieties currently available, Grasslands **Choice** chicory is very persistent and productive. It was bred from Grasslands Puna specifically for dairy cow grazing. **Choice** is productive as a six month crop (Figure 2) while also being a longer lived option in the Waikato (Figure 3). Most other chicory cultivars are shorter lived in nature and plant populations tend to thin drastically after going through their first winter and the following spring, especially in wetter environments.

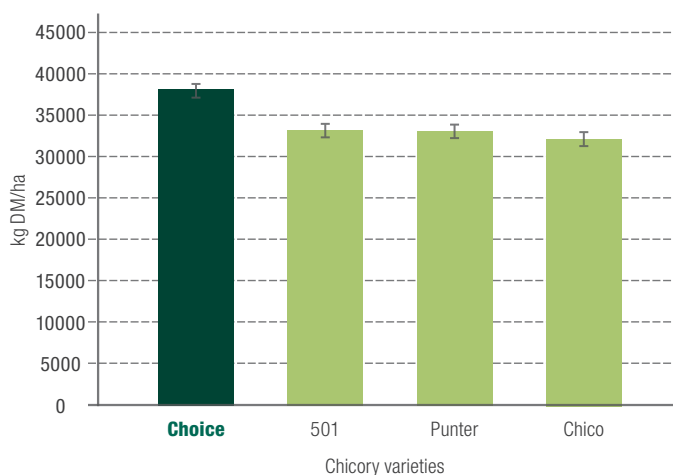


**Choice** chicory on the left showing leaf disease tolerance.

**Figure 2. Chicory production over 6 months in the Waikato (kg DM/ha)**



**Figure 3. Chicory production over 16 months in the Waikato (kg DM/ha)**



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