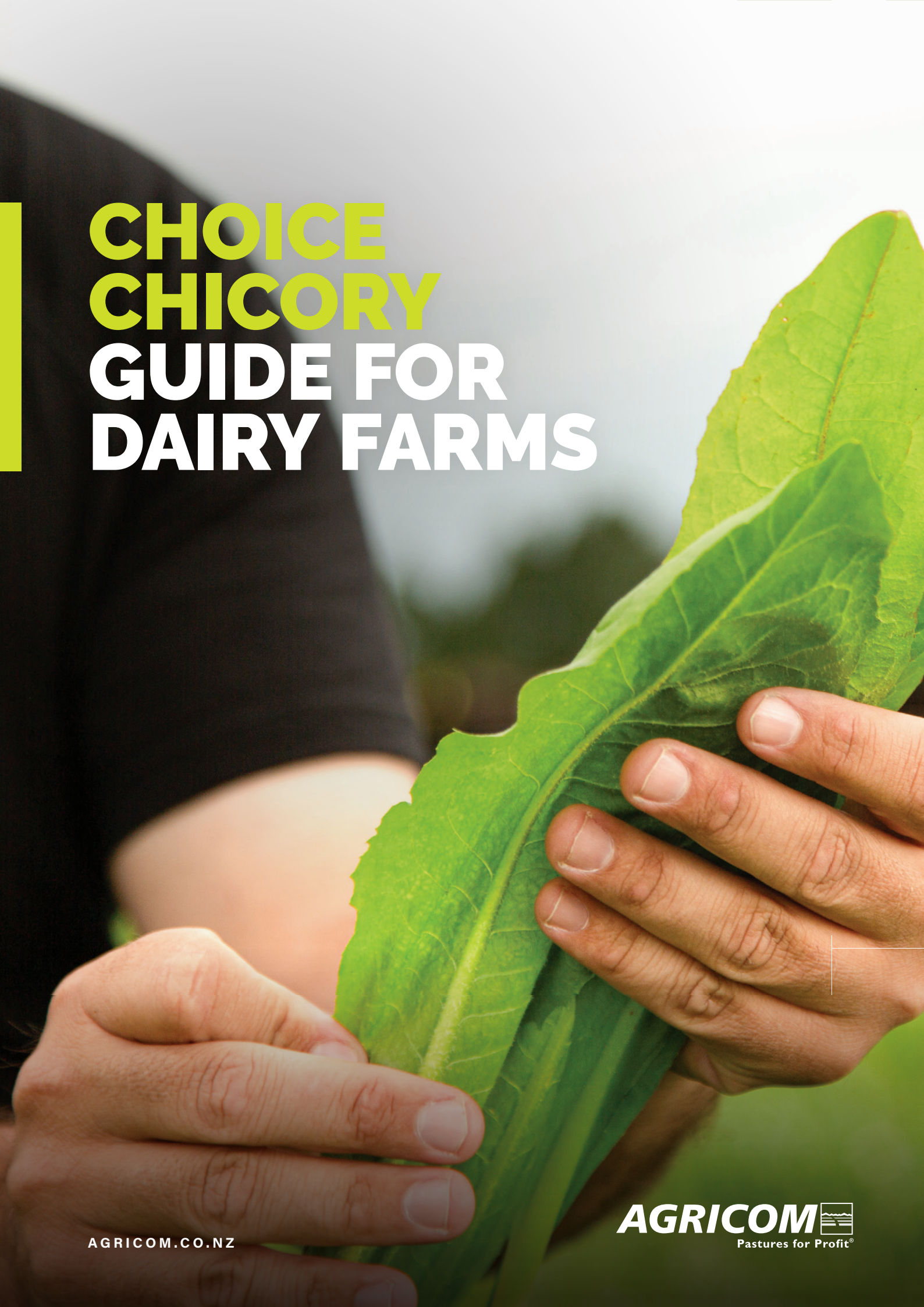
CHOICE CHICORY GUIDE FOR DAIRY FARMS



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FEATURES OF CHICORY

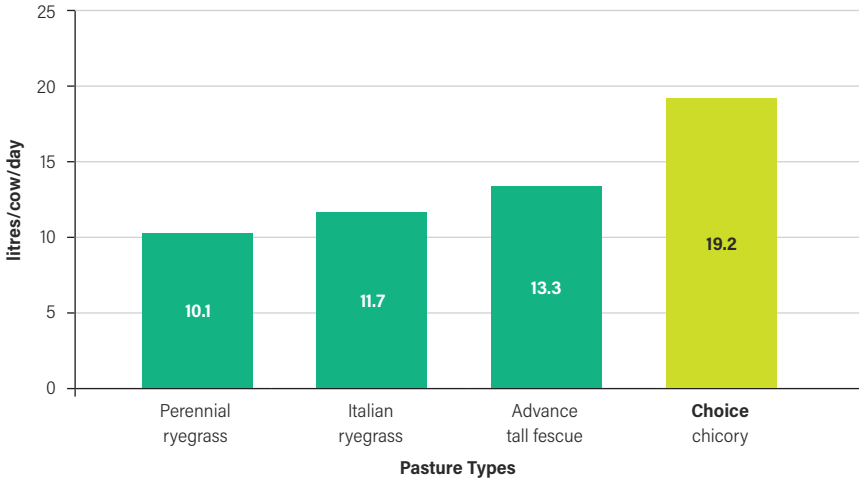
Chicory is a herb with a deep taproot capable of providing high volumes of very high quality forage through the summer and autumn months. This makes **Choice** chicory an excellent option as a 6 to 8 month multi-graze summer crop to supplement milking cows when ryegrass growth rates and quality are poor. **Choice** has been thoroughly proven on farms and in research, to substantially increase milksolids production in dairy systems across New Zealand.

- New Zealand bred and certified variety
- High summer production. Trials run by DairyNZ have yielded up to 16 t DM/ha over 6 months
- Large taproot provides good drought tolerance
- Very high quality feed source (11.5 to 13 MJME/kg DM and 22% to 27% crude protein)
- Provides an opportunity to control difficult weed grasses like yellow bristle grass
- Elevated mineral content (Zn, Cu, Mg, Ca, K)
- Reduced facial eczema spore levels
- Good grazing tolerance
- Reduces risk of Fat Evaluation Index (FEI) gradings during the summer
- Ideal break crop for reducing insect pest (e.g. black beetle) build-up

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 winter and spring soils associated with many dairy environments. Chicory's deep taproot, high drymatter growth rates and excellent regrowth potential in hot conditions make 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 is poor (below 10 MJME/kg DM), feeding **Choice** at 20-40% of the diet can increase milksolids production by 17%[1]. 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.

[1] Lee & Minneé. (2012). DairyNZ Technical Series, August 2012. Chicory and plantain – your questions answered.

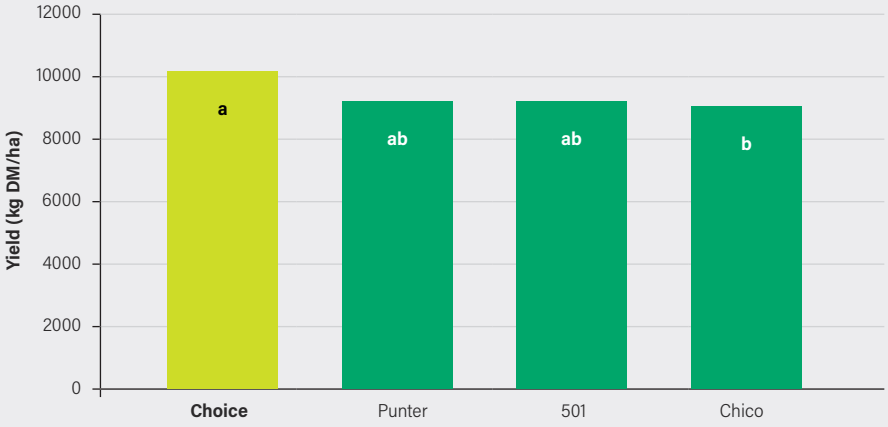
VARIETIES OF CHICORY

Spadona type chicory on the left, **Choice** on the right showing tolerance of leaf disease.

Choice is a proven fast-starting variety that is high yielding and a profitable 6-month summer crop. Through our extensive trialling system and on-farm use, our farmers have confidence that **Choice** is a reliable performer, as shown in Figure 2. **Choice** was bred from true perennial chicory parents under grazing evaluations (including dairy) and selected for high drymatter production, disease tolerance and recovery after grazing. We have not seen annual type chicories have a statistical yield advantage for first grazing over perennial type chicory, and **Choice** over many years has met expectations for time to first grazing.

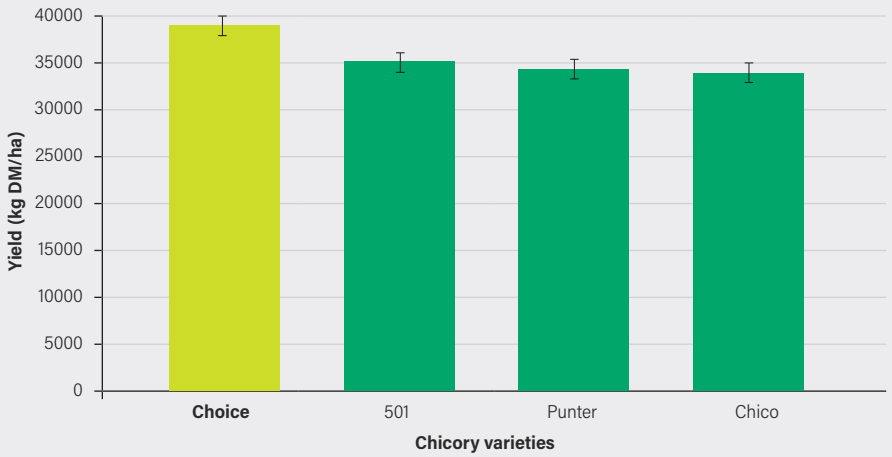
Some other chicory cultivars (spadona's) are shorter lived by nature due to being susceptible to diseases and plant populations tend to thin drastically, especially in wetter environments (see photo). **Choice** is a longer-lived chicory due to its strong perenniality and disease tolerance, therefore in desired situations with fertile and free draining ground **Choice** can be used as a two year crop (as shown in Figure 3).

Figure 2. Yield (kg DM/ha) summary of four upper North Island trials from 2013-2019 over 7 month period (Oct to April)



Statistical Significance:
Letters that are different indicate a statistical difference while the same letter indicates no difference.

Figure 3. Chicory production over 16 months in the Waikato (kg DM/ha). Sown in spring 2013



USES OF CHICORY

1. PURE SWARD

Requires different establishment and management to grass pastures. It is however the most effective way of increasing animal performance as it provides a greater amount of high-quality feed over summer to supplement the cow's diet.

CULTIVAR	SOWING RATE (KG/HA)
Choice chicory	8-10

2. FINISHING MIX FOR HEIFER GRAZING

Requires similar establishment and management to a pure sward of chicory but can be more suitable as 18-24 month crop due to the clover content.

CULTIVAR	SOWING RATE (KG/HA)
Choice chicory	6
Relish red clover	4
Attribute white clover	3
TOTAL	**13**

3. HIGH PERFORMANCE GRASS/CLOVER MIXED PASTURE

Great option when using short term pastures and wanting to increase animal performance on a pasture based system. Requires very little change to pasture establishment and management. Ideal for run-off's where growing out young stock or taking off supplement i.e. silage.

CULTIVAR	SOWING RATE (KG/HA)
Mohaka AR37 tetraploid hybrid ryegrass	16
Choice chicory	2
Relish red clover	5
Attribute white clover	3
TOTAL	**26**

4. OVERSOWN/UNDERSOWN INTO PASTURE

Good establishment can be achieved by spreading seed at 1-3 kg/ha just prior to grazing in spring or undersowing into pasture after grazing. This suits grass pastures planted in autumn without chicory which require thistle spraying in the first winter, or running out/open pastures to fill in gaps.

ESTABLISHMENT OF CHOICE CHICORY

Key farmer growing tips to get the most out of your Choice chicory this summer.

1. SPRAY OUT

- Spray out existing pasture and consider using an insecticide.

2. ENSURE A GOOD ESTABLISHMENT

- If cultivating, take the time to create a fine, firm seedbed that is free of dirt clods.
- For best results sow **Choice** at 8-10 kg/ha of treated seed.
- Do not sow the seed deeper than 10 mm.
- Aim to sow as soon as practical (see sowing date trial data below) once soil temp reaches 12°C and rising.
- Sow with 150 kg/ha of DAP down the spout while drilling if possible or broadcast between 175-200 kg/ha of DAP.
- Rolling post drilling helps to consolidate seed contact, especially if conditions are drying.

3. SLUG BAIT

- Apply slug bait to the paddock surface during drilling or soon after on the same day.
- This will help to maintain plant survival in the early stages when slugs can cause severe damage.
- This step is especially important for direct drilled paddocks and around the edge of cultivated paddocks.

4. SPRAY PROGRAMME

- Spray when suitable as described by label guidelines with a flumetsulam-type product and a grass herbicide to control establishing weeds and grass weeds before they grow too big, and the efficacy of the herbicide diminishes. Consider including an insecticide to prevent insect damage when plants are at the seedling phase.

5. SECONDARY NUTRIENTS

- Base subsequent nutrient application on recent soil test information and current climatic conditions.
- Applying secondary nutrient (e.g applying 30-40 kg N/ha after every second grazing) in between the grazing round, depending on the weather, will help to improve the recovery of plants and maximise potential yield.

SOWING DATE COMPARISON

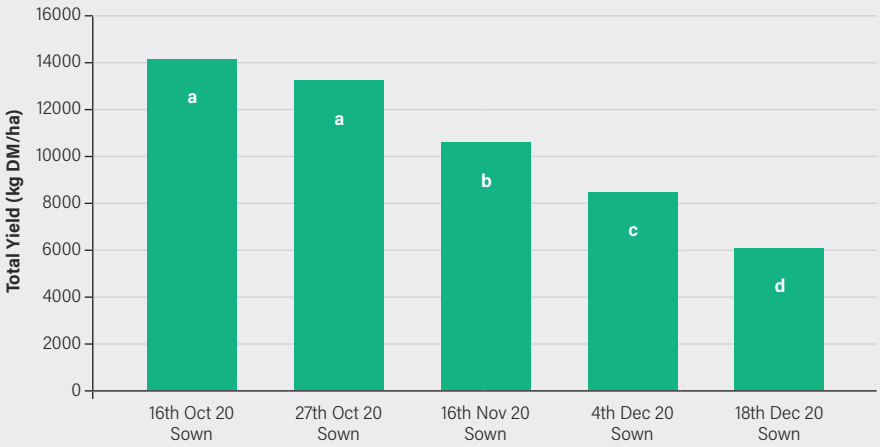
In addition to running yield trials between cultivars, Agricom has also been looking into other aspects such as different sowing dates of **Choice** and how this affects the total yield grown (kg DM/ha) to maximise production. Figure 4 shows sowing **Choice** in October provides the highest drymatter production taken up until end of April.

The key points found from sowing Choice in October:

- Early first grazing (early-mid December) to boost milk production when ryegrass quality is low from seed head development
- Maximises number of grazings; 6-8 grazings from an October sowing versus only 2-3 grazings from a late sowing

The take home message here is aim to sow chicory by mid-October, as there could be up to a 50% loss of yield (kg DM/ha) by planting in December.

Figure 4. Total accumulated yield (kg DM/ha) until the end of April 2021, from five sowing dates between the 16th of October 2020 and the 18th of December 2020, for Choice chicory in the Waikato.



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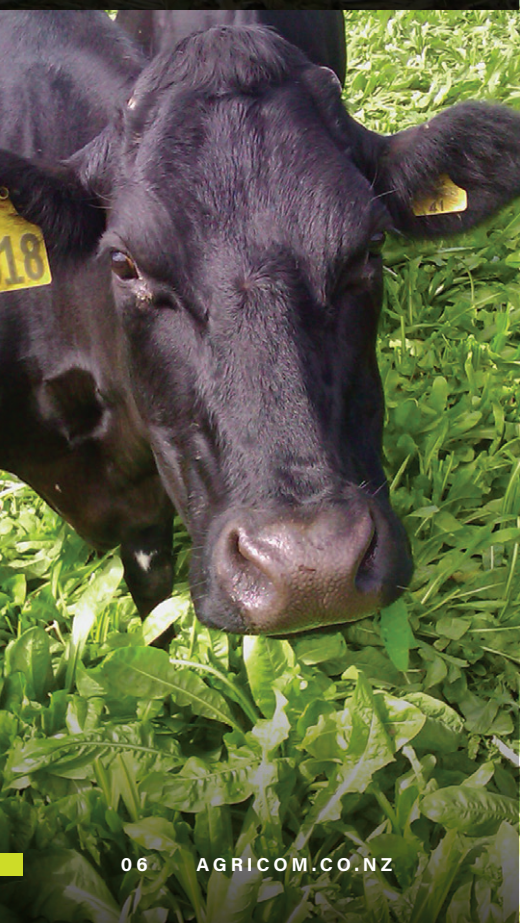
SYSTEMS FOR DAIRY FARMS

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



The best system is to establish several paddocks of pure chicory close to the dairy shed. To ensure a daily 3 hour diet of chicory, the amount of chicory required to be planted is 4-5 ha per 100 cows (see table below).

CHICORY TO BE FED PER COW	AREA IN SOW IN CHICORY	DAILY AREA OF CHICORY*
2 kg DM/day	2.3 ha / 100 cows	0.11 ha / 100 cows
3 kg DM/day	3.5 ha / 100 cows	0.17 ha / 100 cows
4 kg DM/day	4.7 ha / 100 cows	0.23 ha / 100 cows

*On a 21 day rotation. Source: DairyNZ Farmfact: Chicory Management (1-72b)

Once well established, an area of chicory (about 0.3 ha per 100 cows) should be fenced off, and cows are moved onto this break for 2-3 hours. Electric wires are moved to the next break within the following day and the process is repeated. Back fencing is preferred to avoid over-grazing on previous breaks if in the paddock for 3 days or more. If in the paddock less than 3 days, then back grazing is not necessary as there is very little grazing of regrowth.

Some farmers prefer to feed chicory just before the afternoon milking where the cows move from their day (grass) paddock to the chicory, as it stimulates cow appetite when they would normally have a lower appetite on grass due to higher summer temperatures.

This system provides a daily diet of chicory, which is important as it reduces any rumen adjustment needed when chicory becomes part of the cow's diet. 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.

Given the small amount of land required to run this system, the per hectare profitability is high. **Choice** chicory is a very cost-effective feed option relative to other feed types like imported feed, especially when yield targets are met. Figure 5 shows that as the yield advantage of chicory over old pasture increases, this decreases the cost (c/kg DM) making it a very attractive option relative to imported feed like Dried Distillers Grain (DDG), Palm Kernel Extract (PKE) or Grass Silage.

Figure 5. Cost of chicory relative to imported feed

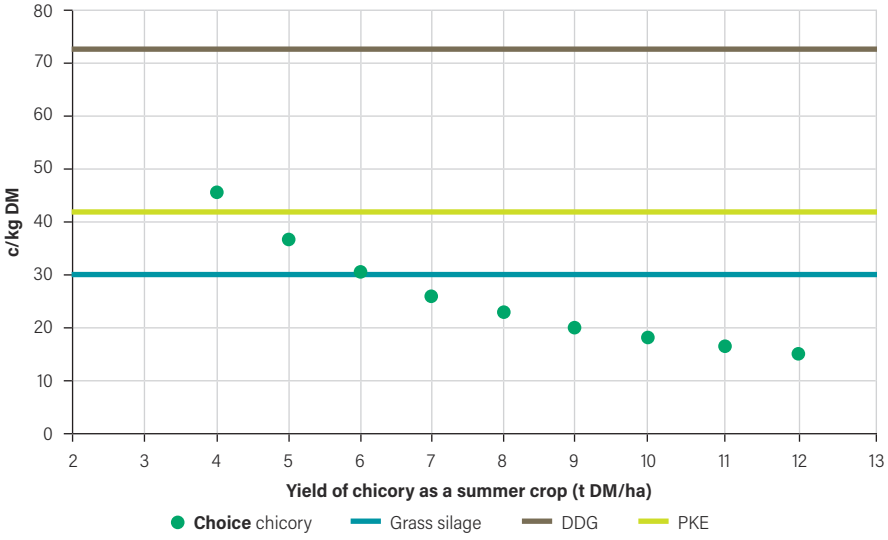


Figure 5 is based on the assumption that old pasture produces 4 t DM/ha from December through to March. The cost of the imported feeds is only a guide and may change throughout the season.

MANAGEMENT OF CHOICE CHICORY

Pre grazing of **Choice** chicory.

Post grazing of **Choice** chicory.

FIRST GRAZING

First graze on chicory can occur once plants are 15-20 cm high and have at least 7 true-leaves. Plants should not be pulling to ensure the tap roots have established well enough to maintain strong plant numbers.

GRAZING RESIDUALS AND ROTATION LENGTH

Chicory is most productive and persistent when it is rotationally grazed. The target pre-grazing mass is 3000 kg DM/ha, or 15-20 cm height, with post grazing residuals at 5 cm. Between spring and autumn this will mean a 21-35 day rotation.

Grazing before the plants have reached required pre grazing masses or grazing below 5 cm will reduce the energy reserves of the plant and overall yield potential. Cows will readily graze below 5 cm if allowed so strategies need to be in place to prevent this from occurring.

FERTILISER

Chicory is a very responsive species to nitrogen fertiliser. The best practice is to apply 30-40 kg/ha of N after every second grazing (when weather permits) to maximise yield potential. Liquid effluent can also be a useful tool to use on chicory paddocks.

AUTUMN MANAGEMENT – REGRASSING

In the autumn after a spring sowing and before the last graze, spray the crop with glyphosate (25 cm cover) and then graze three days later. Immediately direct drill in new perennial ryegrass with **AR37** endophyte with DAP down the spout. **Choice** is highly productive in late autumn and left unchecked will often smother out young grass.

SECOND YEAR MANAGEMENT

If chicory swards are taken through their first winter to be run as a second year crop, then grazing should be avoided when soils are wet as treading damage into the crown of the plant will reduce plant numbers and drop yield potential into the second summer.

In mid-spring of the second season, chicory plants will develop reproductive stems. This should be grazed off, close to the ground, while it is small (< 10 cm) and soft. A second grazing just two weeks later will reduce stem regrowth for the rest of the season. A minimum of 30-40 plants/m^2 is required to make the second year of chicory profitable.

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.

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