

Chicory Guide for Sheep and Deer Farms



Description

Chicory is a perennial herb with a deep tap root, high forage quality, and high warm-season pasture growth. It has been thoroughly proven on farms, and in research, to substantially improve production both per animal and per hectare in sheep & deer.

Features of chicory

- High forage quality
- Improves animal performance
- Higher carcase yields in lamb
- Increases ovulation rate in ewes (up to 22%)
- Preferentially grazed by many animal species
- High summer growth
- Slow winter growth in cold climates
- Perennial with moderate persistence (3-4 years)
- Good drought tolerance, deep tap root (1.5 m)
- Elevated mineral content (Zn, Cu, Mg, Mn, P, Ca, K)
- Anthelmintic affect in sheep and red deer
- Reduced faecal egg counts in lambs
- Reduced facial eczema spore levels
- Good grazing tolerance



Performance of Chicory

Chicory is often used as a special-purpose lamb-finishing crop. Lambs can grow on average 68% faster than on perennial ryegrass (Table 1), and higher numbers can be carried. Deer can grow on average 41% faster compared with ryegrass/white clover pastures and are likely to produce more spiker velvet. Faecal egg counts are reduced in lambs grazing chicory compared with perennial ryegrass, and red deer have greater resilience to internal parasites. Chicory also carries lower spore levels for facial eczema and zearalenone. It has also been shown to boost ovulation rates in ewes by up to 22%.

Table 1. Growth (g/day) of sheep and deer grazing chicory and perennial ryegrass.

Author	Animal	Perennial ryegrass	Chicory
<i>Scales et. al (1995)</i> ¹	Lamb	158	280
<i>Fraser and Rowarth (1996)</i> ¹	Lamb	121	192
<i>Kusmartono et. al. (1996b)</i>	Deer	192 ²	282
<i>Min et. al. (1996b)</i>	Deer	172 ²	230

¹ Mean of several trials.

² Perennial ryegrass/white clover pasture.

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On-farm experience of chicory as a perennial lamb-finishing crop has shown liveweight gains of 220 to 400 grams/head/day, so farmers should budget on a long-term average of 250. Carrying capacities have ranged from 40 to 70 lambs/ha throughout summer, so a budget of 40 on dryland and 55 with irrigation could be used.

Chicory can produce over 20,000 kg DM/ha in a year with reasonable summer moisture, and daily growth rates around 80-100 kg DM/ha/day in summer/autumn.

Limitations of Chicory

Chicory does not persist indefinitely, due to fungal root diseases slowly increasing in the soil, and repeated selective grazing when mixed with less desired species. Choice chicory normally lasts for about three years, but semi-annual cultivars thin drastically in their first winter. Persistence is poor on heavy and poorly-drained soils, when it suffers pugging damage, when planted with dense grasses, and when mostly set-stocked. The need for rotational grazing may require extra fencing, stock water, and labour. Many weeds, including buttercup (giant and annual), stinking mayweed, and chickweed can be controlled with a registered herbicide (Preside™). Chicory is however susceptible to thistle herbicides, so these need to be controlled before establishment, and after establishment by way of mowing, grubbing, spot spraying, or wiping.

Uses of 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 to 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). Deer and sheep also selectively graze chicory, so persistence in the pasture can be reduced when paddocks are grazed for long periods. Best results come from sowing with highly palatable grasses such as tetraploid ryegrass, timothy, or tall fescue.
2. **As a special-purpose crop** – this is less common because it requires different establishment and management practices to grass pastures. It is however, a more effective way of increasing animal performance because it provides a greater amount of high quality feed over summer. This is the most effective way to increase animal growth rates and carrying capacity when using chicory to finish young stock. It also allows for selection of suitable soil types, and grazing management that is specific for chicory. Seed is sown at 4 to 6 kg/ha with white and red clover. Low rates of quality ryegrass can also be over-drilled in autumn to boost winter growth.
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 pasture

Establishment of 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 in the first three months. Spring sowing is highly preferred, and late-autumn planting 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 un-registered pre-emergence herbicides are used when establishing chicory without grass or plantain. Many weeds can be controlled in the early stages of establishment with a herbicide at recommended rates.

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 pasture when soils are 12°C and rising, most likely to be late-September.
2. Spray out existing pasture with glyphosate + Granstar.
3. Wait for 10-12 days, mouldboard plough, roll furrows, power harrow to shallow depth.
4. Farmers have successfully used Triflurilan as a pre-sowing herbicide (Triflurilan is not registered in NZ for use on chicory, use at your own discretion), at standard rates (2 l/ha, or 800ga.i./ha for loam and clay soils), incorporate into the soil **immediately** (i.e. 1 hour) after spraying (e.g. shallow power harrows to 5-10 cm). Triflurilan cannot be used when grass is planted with chicory. 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 20 mm (ideal is 10 mm).
7. Spray-irrigate to germinate if no rain after sowing.
8. Monitor weeds, and if found (e.g. nightshade and shepherd's purse will escape Trifluralin), 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 (see below).
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.

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

Varieties of Chicory

Of the chicory varieties currently available, Grasslands Choice is one of the most persistent and productive. It was bred from Grasslands Puna, and has improved cool-season growth and establishment vigour.

Figure 2. Chicory production in a tall fescue sward over 30 months - Kimihia Research Centre, Canterbury

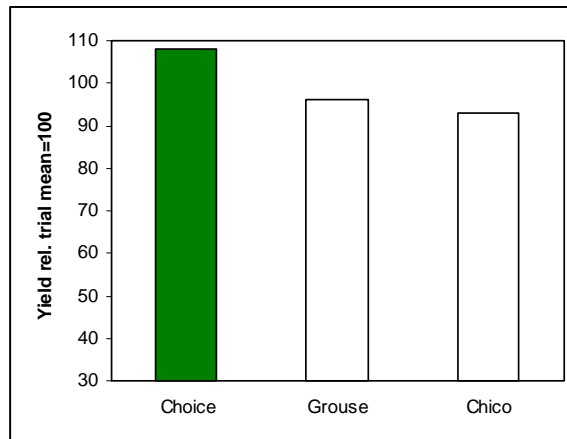
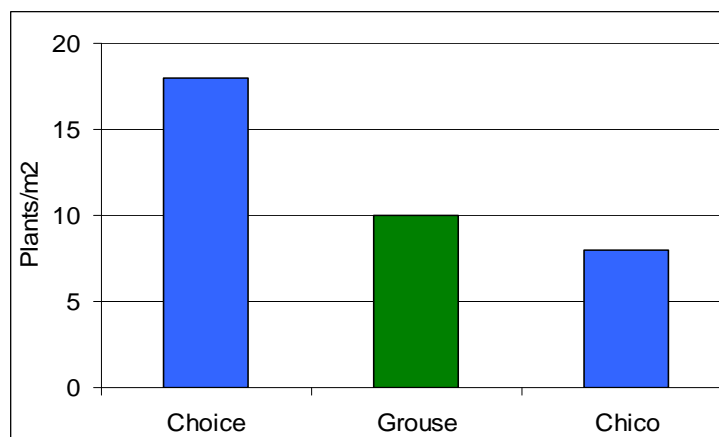


Figure 3. Chicory plant populations three years after planting - Kimihia Research Centre, Canterbury



Farmers have recorded higher dressing out percentages in lambs finished on chicory



Biennial chicories (right) produce more stem than Choice (left) after their first winter

Suggested Mixes

1. Specialist Chicory Stand

Cultivar	Sowing Rate (kg/ha)
Choice chicory	5
Tribute white clover	4
Sensation red clover	5
TOTAL	14



Specialist chicory stand

2. Year-round mixed pasture

Cultivar	Sowing Rate (kg/ha)
Choice chicory	4
Ohau AR1 tetraploid long-rotation ryegrass	12
Tribute white clover	4
Sensation red clover	5
TOTAL	25



Year-round mixed pasture

Management of 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 25 to 35 day rotation. When animals are set-stocked on chicory/grass mixed pastures, animals will selectively graze chicory plants and therefore reduce the chicory's production, competitiveness with grass, and persistence.

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 re-growth for the rest of the season. This management will require a high stocking rate, so on a sheep farm may require ewes with older lambs at foot to be moved onto the chicory. Stem growth doesn't need much control when chicory is planted in a grass mix because animals selectively graze the chicory plants.

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).



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

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.

Over-drilling with grasses will increase ground cover in winter and reduce winter grass weed invasion, but care must be taken to avoid grazing when soils are wet.

Farm Systems for Specialist Chicory Stands

For lamb or deer finishing, the chicory stand should be divided into at least 6 paddocks, with animals shifted every four days during good growing conditions. Lambs should stay on the chicory pasture until they are sold because they can lose appetite and weight when moved onto grass pasture. Regular drafting/weighing will be needed because lambs can gain over 2 kg/week, with drafted lambs replaced to maintain stocking rate.

Starting a rotation requires forward planning, because if animals are introduced when the first paddock has 2500 kg DM/ha cover, the sixth paddock will be too rank (4500 kg DM/ha) when it is grazed. The rotation may need to start at low covers, with less time in the first 2-3 paddocks, to achieve the desired pre-grazing mass (3000 kg DM/ha) and grazing frequency (25-35 days).

Putting animals into a chicory crop with more than 3500 kg DM/ha cover for several days results in large amounts of wastage because a lot of leaf is trampled into the soil and seldom eaten by animals.

Stocking rate is important to ensure good utilisation. A crop with good plant density and moisture in the soil (top 50 cm) will support about 50 lambs/ha through summer.



The ideal pre-graze height for chicory