



FACT SHEET

JUNE 2014

INCREASING CATTLE GROWTH RATES WITH CHICORY

Summary

Within this study, young cattle achieved >1kg liveweight gain/day (LWG) during summer/autumn when grazing chicory. Cattle grazing chicory attained slaughter weights at a younger age than cattle on ryegrass based pastures. With good establishment and management chicory can be profitable within a beef system.

Results of this study show:

- Chicory grew 3 – 4 times the dry matter compared with existing ryegrass based pastures during summer/autumn. Both herbage types showed similar growth during winter/spring in Northland
- Chicory carried twice the number of stock during summer/autumn compared to ryegrass based pastures
- Chicory herbage had significantly higher quality than ryegrass based herbage during summer/autumn (chicory average 11.3 MJ ME/kg DM, ryegrass 9.7 MJ ME/kg DM)
- By May, autumn born bull calves that had grazed chicory for 4 months were 44 kg heavier than bulls on ryegrass based pastures
- By June, spring born bull calves that had grazed chicory for 5 months were 76 kg heavier than bull calves on ryegrass based pastures
- Bulls slaughtered off chicory showed heavier weights and better carcass yield
- Approximately half of the liveweight advantage gained by grazing chicory was lost after bulls had been back on ryegrass based pastures for 6 months
- Farm systems modelling shows that establishing 7% of farm area in chicory which lasts 2.5 years could result in an increase in farm profit of approximately \$200/ha
- Planting of forage crops contains risk of poor establishment and poor persistence. Sourcing good advice and applying ideal grazing management are important to achieving a profitable crop

Project background

'Finished by 20 Months' is a Beef + Lamb New Zealand project supported by the MPI Sustainable Farming Fund and the Hine Rangi Trust. This project focused on how Northland beef farmers might improve farm profitability and sustainability through growing cattle faster and finishing them at a younger age.

Increasing young cattle LWG provides improvements in:

- Feed Conversion Efficiency
- Meat quality
- Less pugging damage (fewer big animals going through a second or third winter)
- Animal health and welfare
- Potentially more profitable, resilient and sustainable farm systems

The study reported in this paper considered whether chicory might be used to enhance cattle growth rates and farm profitability.

Introduction to chicory

Chicory is a perennial herb with a deep tap root which has high nutritional quality and the potential to produce high dry matter yields from spring through to autumn. It thrives in free draining fertile soils, however can tolerate low pH soils and also heavy clay soils as long as care is taken not to graze with cattle under wet conditions.

Chicory can be grown as a pure crop, with or without clovers, but is also commonly included with grass pasture mixes. Chicory can be relatively difficult to establish, advice should be sought from those experienced in chicory establishment and management. Weed control options are limited.

Chicory is commonly grown as one summer crop, however with good establishment and management it can often last 3 seasons or more. Chicory should be rotationally grazed with short grazing durations. It is best suited to systems that are intensively subdivided or where break feeding with back fencing options are available.

Blackwell study

Farm background

John, Lurline and Peter Blackwell farm 345 ha of rolling to medium hill land at Okahu, south of Dargaville, Northland. The main component of their farming business is finishing Friesian bulls, although they also run a small breeding ewe flock. Soils are predominantly heavy clay with good soil fertility levels.

The farm is intensively subdivided. Paddocks used for bull finishing are commonly 3 - 4 ha, subdivided down to 0.4 ha with semi-permanent fencing (polywire and fibreglass rods). Each 0.4 ha paddock has water. The farm has mainly ryegrass pastures, no kikuyu.

The Blackwell's have historically used chicory to finish lambs. This project provided the opportunity to investigate the use of chicory for growing young bulls.

Chicory establishment

Over 3 seasons (2011 - 2013) between 6 and 8 ha of chicory was established each year for use in this study. Paddocks were sprayed out in September or October with glyphosate, disced and power harrowed. Seed was sown using a seed spreader behind a quad bike and then chain harrowed. DAP was applied at 200 kg/ha at the time of sowing and then additional nitrogen applied in early summer and autumn as moisture allowed.

Costs of chicory establishment are below:

Spray - 4L glyphosate/ha	= \$20
Fertiliser - DAP & Urea	= \$264
Tractor time - 2.5 hours/ha @ \$100	= \$ 250
Chicory seed - 6 kg @ \$16.08	= \$96

Total \$ 630/ha in 2011/12, \$ 740/ha in 2012/13

Out of the seven paddocks established in chicory for this study, three have required an application of Preside™ herbicide application to control broad leaf weeds.

Study details

The Blackwell's have undertaken three different grazing studies during this project. Each of the studies has split a mob of bulls and placed half on chicory over summer/autumn and half on existing ryegrass pastures. Treatments have been replicated twice. Trial details and stocking rates are shown below.

Table 1. Details of grazing studies undertaken over 3 seasons

	2011/12	2012/13	2013/14
Age of chicory at start of trial	8 weeks	8 weeks	12 months
Age of bulls at start of trial	8 months	4 months	16 months
Bulls/ha - Pasture	3.0	2.5	1.1
Bulls/ha - Chicory	5.0	5.1	3.0

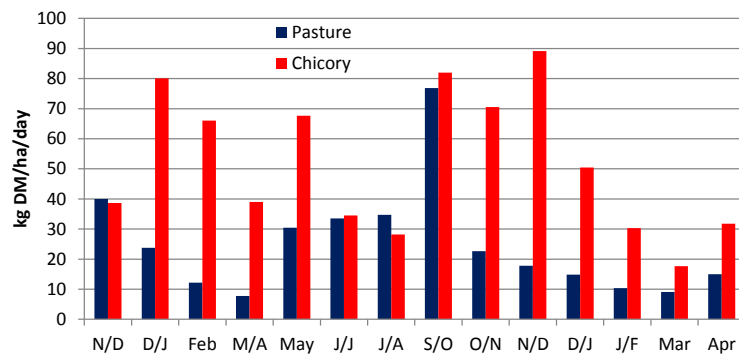
The first summer/autumn (2011/12) had high rainfall while the following two seasons were very dry with rainfall well below normal.

Chicory versus ryegrass pasture growth

Four cages were placed on chicory and another four on adjacent existing ryegrass based pastures from November 2012 - May 2014. Cages were cut either monthly or 6 weekly depending on growth. This monitoring coincided with two dry summer/autumn periods.

Figure 1 shows the herbage growth rate. From December to June, chicory produced 3 to 4 times the herbage of the ryegrass pastures in both years. During winter and early spring the production was very similar between the two herbage types.

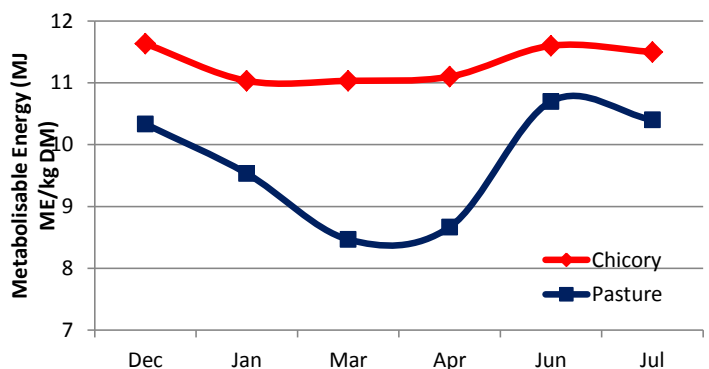
Figure 1. Pasture and chicory growth rates under cages from November 2012 - May 2014



Pasture quality

Pasture samples were collected from the next paddocks to be grazed during the three studies. These samples have been analysed for feed quality and assessment of metabolisable energy is shown in the figure below. Feed quality differences are greatest during summer/autumn of both seasons shown below.

Figure 2. Average estimated metabolisable energy in chicory or ryegrass based pasture (average of three seasons)



Bull growth rates

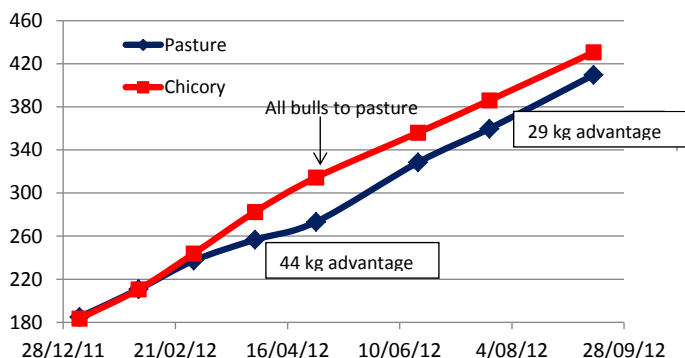
2012 Study

During the summer/autumn of 2012, two mobs of 8 month old autumn born Friesian bulls were grazed on chicory and another 2 mobs on ryegrass based pastures adjacent to chicory paddocks. Each mob had approximately 20 bulls.

This summer/autumn had high rainfall and pasture conditions were very good with high levels of clover and green leafy pasture throughout the period. As a result the bulls on pasture had an average growth rate of 0.73 kg LWG/day between 30th December to 30th April. Bulls on chicory averaged 1.13 kg LWG over this same period. Chicory bulls were 44 kg heavier at the end of April.

Bull mobs were then mixed together and grazed on ryegrass based pastures through winter and spring. By mid-September the advantage of the chicory bulls had reduced to 29 kg and 24 kg by mid-November. Thus the pasture bulls had 'compensated' by showing higher LWG over the winter/spring period.

Figure 3. Average liveweights of bulls grazing either chicory or pasture during summer/autumn 2012



Autumn born bulls on chicory shifted daily



Ryegrass versus chicory - February 2013

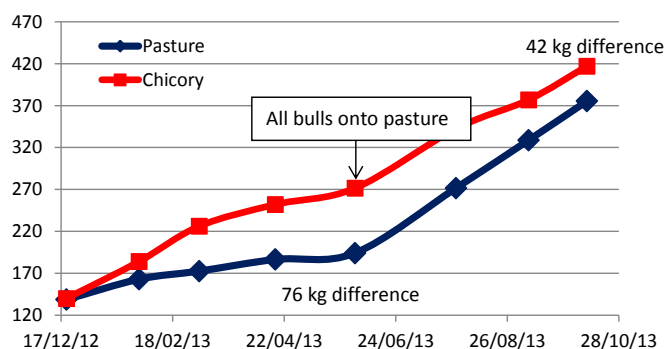
2013 study

During summer/autumn 2013, two mobs of spring born Friesian bull calves were grazed on chicory and another two mobs on ryegrass based pasture between 20th December and 1st June. Each mob had approximately 20 bulls.

This summer/autumn was very dry and ryegrass pasture growth was poor as shown in Figure 1. Bulls on the ryegrass pastures required approximately twice the area of the bulls on chicory. Despite this greater grazing area, the bulls on pasture grew 0.34 kg LWG/day during the trial period while the bulls on chicory grew 0.81 kg LWG/day. By the 1st of June the bulls on chicory were 77 kg heavier than the bulls on ryegrass.

All bulls were placed on pasture from the 1st June through to the 10th October. The pasture bulls compensated and by mid-October the liveweight difference between the ex-chicory and ryegrass pasture bulls was only 42 kg.

Figure 4. Average liveweights of bulls grazing either chicory or pasture during summer/autumn 2013

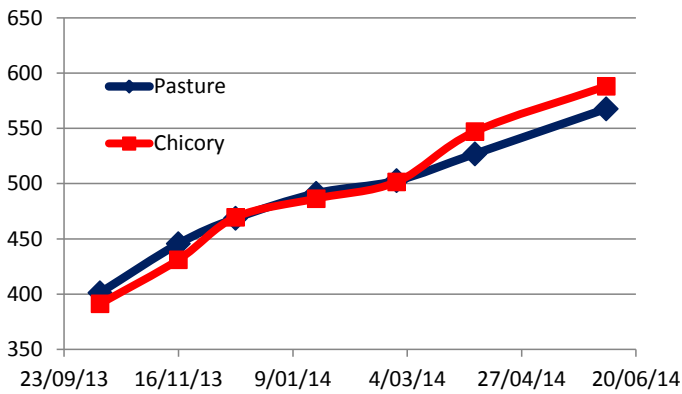


2013/14 study

During late spring - late autumn 2013/14, two mobs of 15 month old bulls were grazed on chicory and two mobs on ryegrass based pasture from 10th October through to early June. Each mob had approximately 20 bulls. This was the same generation of bulls that had been used during the study the previous summer/autumn, therefore some bulls had ryegrass based pastures only throughout their lifetime, some had chicory the first summer/autumn and then ryegrass after that and some had chicory both summer/autumn periods.

The summer/autumn was again very dry and ryegrass pasture growth was poor as shown in Figure 1. Bulls on the ryegrass pastures required almost three times the area of the bulls on chicory. During late spring and early summer bull growth rates were similar on both forage types, however during autumn bulls on chicory showed better growth rates. Overall, these older bulls on chicory did not display the growth rates seen with younger cattle during the previous two seasons.

Figure 5. Average liveweights of bulls grazing either chicory or pasture during summer/autumn 2014



In late February any bulls >520 kg liveweight were slaughtered. The table below shows the slaughter data. This slaughter was brought on by a need to destock the farm due to drought conditions. More bulls off chicory achieved the cut-off liveweight than off pasture. In addition bulls off chicory showed considerably higher yield, likely somewhat caused by less gut fill.

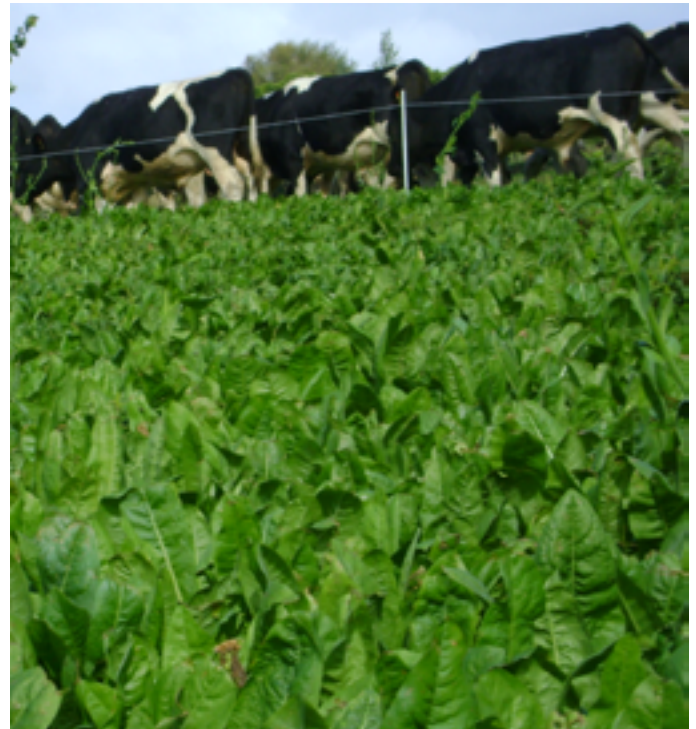
Table 2. Proportion of bulls at slaughter weight, average carcass weight, dressing percentage and value

	>520 kg LWT	Average Carcass Weight	Carcass Yield %	\$ Value/head
Pasture - Pasture	21%	252 kg	47.3%	\$1030
Chicory - Pasture	52%	262 kg	49.3%	\$1082
Chicory - Chicory	68%	275 kg	51.8%	\$1152

Farm Systems Analysis

Farm systems modelling was undertaken to further understand the influence of chicory within a full farm system based on the information collected within this study. Farmax® software was used for this modelling. The assumptions made for this modelling were:

- Chicory sown into 7% of the farm each year and lasts 2.5 years
- Chicory pastures produce 12 tonne of DM/ha in the first and third seasons, and 16 tonne in the second season (which has a full 12 months) including nitrogen response
- Existing ryegrass based pastures produce 8.4 tonnes of DM/ha
- Both farm systems have an even mix of spring and autumn born bulls purchased at 110 kg liveweight and run through to finishing - 3 bulls/ha (same stocking rates)
- Spring born bulls slaughtered between 26 - 30 months of age, autumn born bulls are slaughtered at 16 - 20 months of age
- Chicory is primarily fed to autumn born bulls to increase their LWG from mid spring - early winter, very little grazing during winter/early spring
- Chicory introduction cost of \$720/ha, new pasture cost of \$462/ha (post chicory)



Bull calves grazing chicory February 2012

The table below shows the carcass weights and farm gross margin/ha for a modelled farm with ryegrass based pastures compared to a farm with chicory being introduced into 7% of land area each season, lasting 2.5 years before being established back into ryegrass. Under these assumptions (which were based on the results of this study) introduction of chicory improved farm gross margin by approximately \$200/ha.

Table 3. Farm systems analysis of 20% of farm in chicory farming spring born and autumn born bulls

	Existing ryegrass pastures	20% of farm in chicory
Autumn born carcass weight	260 kg	309 kg
Spring born carcass weight	292 kg	317 kg
Gross margin/ha	\$967	\$1,169

The Blackwell's have experience with chicory establishment and good infrastructure to utilise chicory with short grazing durations. The results of this study are somewhat due to those skills and resources and could differ under different circumstances.

For more information

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