

# Northland's diversified forages



Lucerne and Herbs  
2016 – 2020





# Project overview

**Objective:** 'Identify and use pasture species that give advantages in absolute yield and/or timing of growth, plus feed quality.'

A **diversified pasture** is "fit for purpose" for a specific environment / farm system. Using a range of pasture species adds *resilience* to pasture systems – diversity of species reduces risk and increases yield.

## Why the interest in evaluating a range of forages?

Perennial ryegrass and white clover do not tolerate hot, dry conditions; their growth and persistence are greatly reduced by drought.





# Lucerne



## Summary

- A high-quality plant, capable of persisting and providing high plant growth on very dry Northland soils.
- To obtain good establishment of lucerne, the most reliable method is to sow it on its own.
- On clay soils, lucerne has not been successful when sown into research plots. (Sowing lucerne into whole paddocks on clay soils was not attempted.)

## Gillatts, Te Kopuru

Roger and Barbara Gillatt have been growing lucerne for 20 years, to:

- 'grow something green' over the summer on their dry, free-draining sand soil
- 'grow a multipurpose forage' able to be grazed and/or taken for hay and/or silage
- 'grow a high-quality feed' for calves or replacement stock.

### **Lucerne growth was measured:**

- using grazing exclusion cages
- for the time period 1 July one year to 30 June the following year.

### **Lucerne was sown in two areas:**

- Paddock (1) – sowing date 2015
- Paddock (2) – sowing date 2017.



Feed quality, soil fertility, insect presence, soil moisture and temperature were also measured.



# Lucerne sown as sole species (cage growth results)

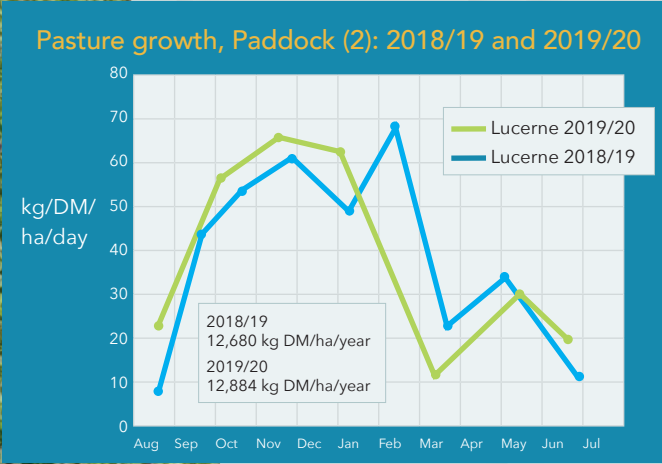
	Paddock (1) Sowing date 2015	Paddock (2) Sowing date 2017
	**Average annual growth 2017/18 & 2018/19	**Average annual growth 2018/19 & 2019/20
*Total growth	16,566	12,782
Lucerne yield	8,820	9,778
As a percentage	53	77

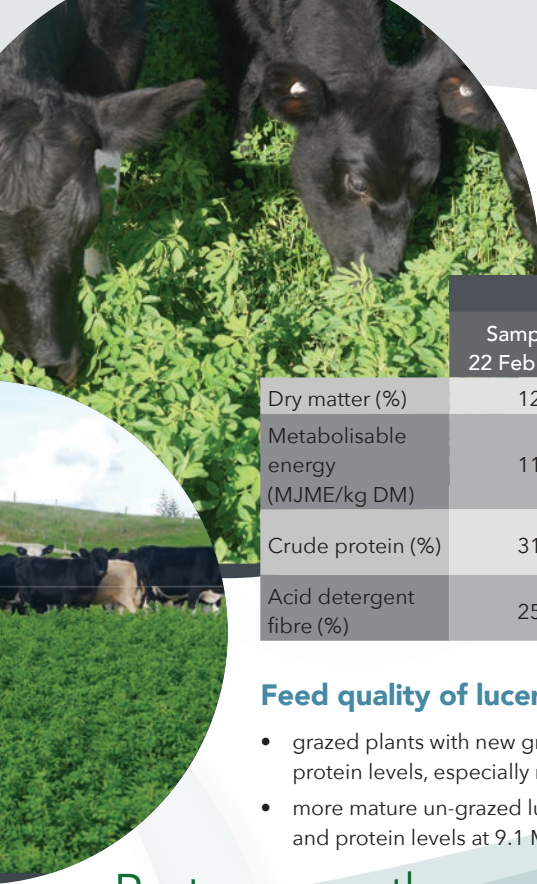
\*Although lucerne was the sole species sown, other pasture species – especially volunteer grasses from the seed bed present – grew and thus contributed to *Total growth*.

\*\* (Average) *annual growth* refers to the time period 1 July one year to 30 June the following year.



Yearly lucerne annual growth profiles are similar...





**Feed quality of lucerne is considerably higher over summer compared to grass-dominant pastures.**

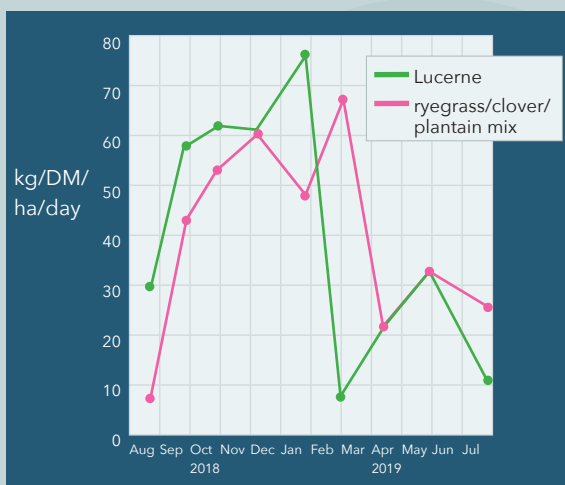
	100% lucerne feed quality		Comments
	Sampled 22 Feb 2018	Sampled 12 Dec 2018	
Dry matter (%)	12.4	13.5	
Metabolisable energy (MJME/kg DM)	11.2	11.9	High / very high c.f. grass-dominant pastures
Crude protein (%)	31.9	36.7	Very high c.f. grass-dominant pastures
Acid detergent fibre (%)	25.4	20.8	

### Feed quality of lucerne is also related to grazing:

- grazed plants with new growth showed high / very high energy and protein levels, especially mid-late February
- more mature un-grazed lucerne, February, showed much lower energy and protein levels at 9.1 MJME/kg DM and 20.5% respectively.

## Pasture growth – lucerne vs ryegrass/clover/plantain mix

A highly productive ryegrass/clover/plantain mix was sown autumn 2018. In January and February 2019 this pasture showed rapidly decreasing growth as soils dried out. Lucerne, on the other hand, grew strongly for another 30–40 days under the same soil conditions.

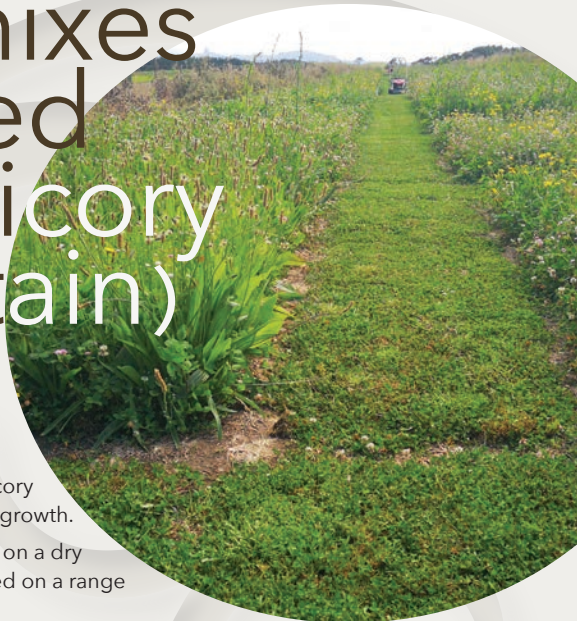




# Pasture mixes with added herbs (chicory and plantain)

## Summary

- The addition of herbs – plantain and/or chicory – to pasture can provide additional pasture growth.
- Although the research work was carried out on a dry sandy soil, similar results have been recorded on a range of Northland soils.
- High soil fertility is required to maximise growth responses from adding herbs.



## Allister McCahon, Te Kopuru

In May 2018, plots were sown with pasture mixes which either *did* or *did not* include the herbs plantain and chicory.

The “standard” mix was based on tall fescue and cocksfoot, white clover, red clover and Persian clover. Plantain and chicory were added to the “standard” mix at 1.0 kg/ha.

All plots were on free-draining sand.



# Results

- Major growth advantage from adding plantain and chicory in Year 1 (2018/19).
- Plantain and chicory contributed 5,715 kg DM/ha and 2,735 kg DM/ha respectively to the first 12 months' growth. Net growth advantage, taking into account less production of all other species (especially grasses) when herbs were present was 2,413 kg DM/ha.
- A large drop in overall growth occurred in Year 2 (2019/20) by 18 May 2020. Most growth reduction was before January 2020 – so was not caused by the drought conditions January–May 2020. Drop in pasture growth was 6,000 kg DM/ha across all treatments – a 41% reduction in growth between the two years.
- A major pasture growth benefit occurred with added herbs in Year 2 under high soil fertility – an extra 5,438 kg DM/ha/year compared to *No herbs* under the same high soil fertility; an increase of 56%.

Treatment	Year 2 growth (tonnes DM/ha)	
High fertility	<i>Plus herbs</i>	15.2
	<i>No herbs</i>	9.7
Low fertility	<i>Plus herbs</i>	6.9
	<i>No herbs</i>	7.0

## Soil moisture

- Soils were very dry 2020 summer – soil moisture levels were below permanent wilting point for approx. 100 days January–April 2020.
- Extremely low soil moisture levels 2020 had a significant impact on plant persistence, as well as greatly reduced growth of all pasture species present.



# First 12-month period

Comparison of treatments – with or without herbs				
	No plantain or chicory present		Plantain and chicory present	
Species	Growth (kg DM/ha)	% of pasture production	Growth (kg DM/ha)	% of pasture production
Annual clovers	5,474	40	4,453	28
Grasses	3,093	23	693	4
White clover	925	7	356	2
Red clover	3,567	26	1,343	8
Plantain	0	0	5,715	36
Chicory	0	0	2,735	17
Volunteer prairie grass	324	2	400	3
Weeds	229	2	241	2
<b>Total pasture growth for first 12-month period (kg DM/ha)</b>	<b>13,612</b>		<b>15,936</b>	

## Points to note

- A net growth advantage of 2,324 kg DM/ha (i.e. 17%) from the addition of plantain and chicory.
- Plantain contributed 5,715 kg DM/ha, chicory contributed 2,735 kg DM/ha – a combined 8,450 kg DM/ha from these herbs.
- Treatments with no plantain or chicory had an increase in growth by clovers and grasses compared to treatment with plantain and chicory added:
  - annual clovers grew an extra 1,021 kg DM/ha
  - grasses grew an extra 2,400 kg DM/ha
  - white clover grew an extra 569 kg DM/ha
  - red clover grew an extra 2,224 kg DM/ha.
- Weed and volunteer prairie grass growth, very similar between the treatment comparisons, were at very low levels.





# Second 12-month period

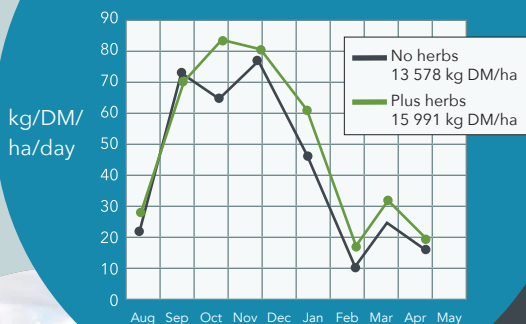
Growth monitoring continued for the second year, 2019/20. A summary of the results follow.

- A major drop, 40%, in growth of Year 2 compared to Year 1.
- For *No herbs*:
  - 5,474 kg DM/ha “lost” in Year 2 from the lack of annual clover compared to Year 1
  - an increase of 3,900 kg DM/ha from grasses in Year 2
  - reduction of almost 3,000 kg DM/ha from red clover in Year 2.
- For *Plus herbs*:
  - major reduction in pasture growth from no annual clover present in Year 2
  - 1,200 kg DM/ha increase from the sown grasses
  - 2,100 kg DM/ha decrease in plantain growth
  - a “holding” in the chicory growth between years.



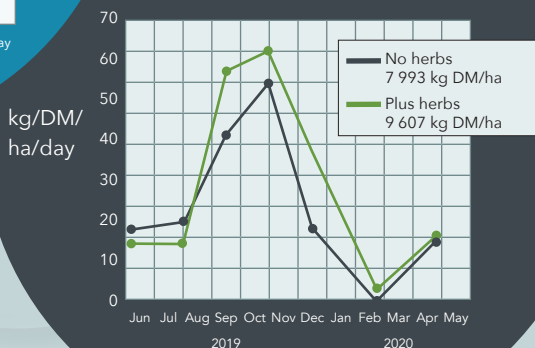
## Year 1, 2018/19

Pasture growth comparing  
*No Herbs to Plus Herbs*



## Year 2, 2019/20

Pasture growth comparing  
*No Herbs to Plus Herbs*



# Soil moisture

Using soil moisture results for the *Herbs* trial area, plus a neighbouring 'Trial paddock', showed the following.

- Soil moisture levels dropped below permanent wilting point in January–February 2019 for an estimated 30 days.
- Soil moisture levels were below permanent wilting point for 100 days January–April 2020.
- Very low soil moisture levels, especially in 2020, will have impacted greatly on persistence of herbs (and other species) as well as effectively stopping plant growth (growth rates across all treatments averaged 1 kg DM/ha/day for the 70 days from 6 January up to 16 March 2020).







## Soil fertility

The end of Year 1 ( June 2019) revealed a major difference in plant growth between replicates – it was assumed this was due to varying soil fertility.

Sampling in August-September 2019 showed:

- very good pH levels @ 6.2-6.9
- major differences in phosphate – from a low of Olsen P 13 to a high of 87
- major differences in potassium – from a low of 5 MAF 'Quick Test' to a high of 9
- low sulfate – quickly available sulfur
- no differences in soil nitrogen.

Fertiliser was applied by hand in September and again in November.

While there were some differences in growth between the high fertility area and the low fertility area in Year 1, the differences were larger in Year 2, especially on a percentage growth basis.

### Points to note

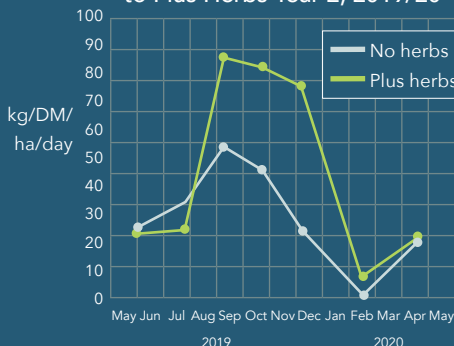
- Low fertility – addition of herbs gave a moderate increase of 1,931 kg DM/ha (i.e. 15%).
- High fertility – addition of herbs gave a moderate increase of 1,515 kg DM/ha (i.e. 10%).

Growth advantages when growing herbs under high soil fertility really showed in Year 2.

In the high fertility soil, the addition of herbs produced an extra 5,438 kg DM/ha compared to *No Herbs* – an increase of 56%.

Soil fertility levels 2018/19		
	Low fertility area	High fertility area
<b>No herbs</b> (kg DM/ha)	12,715	15,225
<b>Plus herbs</b> (kg DM/ha)	14,646	16,740

**High fertility**  
Pasture growth comparing No Herbs  
to Plus Herbs Year 2, 2019/20



# Acknowledgements

The **Northland Diversified Forages Project** has been funded by the Ministry for Primary Industries, through their Sustainable Farming Fund.

Additional funding from *Hine Rangi Trust, T R Ellett Agricultural Research Trust, Ballance Agri-Nutrients, Foundation for Arable Research, Northland Dairy Development Trust, Agricom, Sweetwater Farms, Northland Beef Council and Northland Regional Council.*

In-kind funding and support have been provided by *Northland Seed & Supplies, Clover Consultancy, Ballance Agri-Nutrients, Foundation for Arable Research, Eurofins and PGG Wrightson Seeds.*

Thanks also due to the farmers directly involved in on-farm evaluation work:  
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