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.

Grass species

Summary

- Cocksfoot, and to a lesser extent, tall fescue, are more productive and persistent plant pasture species than perennial ryegrass.
- Feed quality of cocksfoot is not necessarily lower quality than perennial ryegrass.
- Perennial ryegrass will not tolerate very dry soil conditions in summer and autumn.
- All the project results relate to plot-scale monitoring no animal grazing involved.

Trial design

Trial sites were set up at:

- Te Kopuru and Awanui in 2017
- Te Kopuru, Awanui, Dargaville and Ruakaka in 2018.

In autumn 2017, "Controls" were sown on the Te Kopuru and Awanui sites - *perennial ryegrass* (20 kg/ha) or *tall fescue* (25 kg/ha) or *cocksfoot* (12 kg/ha), each with 5 kg/ha of white clover.

In autumn 2018, "Mixes" were sown on the four sites at Te Kopuru, Awanui, NARF (Northland Agricultural Research Farm at Dargaville) and Ruakaka – *perennial ryegrass* at 10 kg/ha, *tall fescue* @ 15 kg/ha or *cocksfoot* at 4 kg/ha; white, red and either balansa or Persian, or berseem annual clovers were added to the various grass species mixes.



Results

• Minor differences in total pasture growth between perennial ryegrass, tall fescue and cocksfoot during the first year post-sowing for "Controls" and "Mixes". The averages of the various sites for total growth Year 1 follow.

Average total pasture growth Year 1 (kg/DM/ha/year)		
Controls	Mixes	
13,768	16,947	
15,325	16,956	
14,400	16,500	
	Average total pas (kg/DM Controls 13,768 15,325 14,400	

• In Year 1, there were major differences for total pasture growth between sites.

Mixed total pasture growth Year 1 (kg/DM/ha/year)			
Site	Ryegrass	Cocksfoot	
Awanui	16,243	16,374	
NARF	20,412	19,241	
Te Kopuru	14,185	13,885	

- Differences in growth between sites were attributable to the various factors that make any farm a unique environment for growing pasture (e.g. microclimate, soil type, soil fertility).
- Total pasture growth differences were much greater in Year 2, for both the "Mixes" and the "Controls" results from the Te Kopuru and Awanui sites follow.



• Strong growth responses from added nitrogen (applied early September and early December) were recorded for tall fescue, and especially cocksfoot.



Species	Controls 2019/20 (Year 3)	Mixes 2019/20 (Year 2)	Average
Perennial ryegrass	4,675	5,752	5,214
Tall fescue	6,085	7,001	
Cocksfoot	8,996	8,435	8,716

Combining "Controls" and "Mixes" results showed a 67% growth advantage of 3,502 (8,716 - 5,214) kg DM/ha/year in 2019/20 for cocksfoot compared to perennial ryegrass.

When did growth advantage for cocksfoot show?

Awanui – Total growth (kg DM/ha)		
	Perennial ryegrass	Cocksfoot
October 2019	53	84
Dec 2019 to Jan 2020	19	37
Jan–Feb 2020	5	6

During drought (January and February 2020), there was no difference in growth between ryegrass or cocksfoot, but when growth conditions were more favourable and nitrogen had been added - cocksfoot showed considerably higher daily growth.

Soil moisture

Both Awanui and Te Kopuru sites had soil moisture levels below permanent wilting periods for up to 100 days in summer and autumn 2018/19 and 2019/20.

> Average summer moisture levels (January–March)



Pasture grass persistence

Pasture composition of the sown grass species showed marked differences by the end of the third year in the "Controls" following initial seeding rates of perennial ryegrass (20 kg/ha), tall fescue (25 kg/ha) and cocksfoot (12 kg/ha), each with 5 kg/ha of white clover..

Species	Te Kopuru (%)	Awanui (%)
Perennial ryegrass	7	25
Tall fescue	85	82
Cocksfoot	100	90

Ryegrass composition and ryegrass growth decreased markedly in Years 2 and 3. This enabled the establishment and growth of volunteer (i.e. non-sown) species.

- At Te Kopuru, volunteer cocksfoot made up 83% of the pasture composition by 36 months.
- At Awanui, C4 grasses (kikuyu and paspalum) made up 74% of the composition in the ryegrass plots.

Feed quality

It is usually considered that fall fescue and cocksfoot have lower feed quality than perennial ryegrass. This was not, however, found to be so for Awanui, where pure grass samples (taken in early December or mid-January 2018-2019) and analysed for feed quality showed the following.

- A slight advantage in energy in the cocksfoot and tall fescue plant material compared to perennial ryegrass.
- Limited differences in the protein levels all of which were low reflected the absolute lack of clover in these pastures.

		Feed quality – A	wanui	2010 ENRITE CONTRACTOR OF CONTRACTOR
1100 M		Perennial ryegrass	Tall fescue	Cocksfoot
A AM	Energy (MJME/kg DM)	9.2	9.8	10.0
	Protein (%)	14.2	12.8	13.9



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Northland's diversified forages

Growth and persistence of pasture grasses 2017-2020