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THE RELISH ADVANTAGE

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IMPROVING RED CLOVER PERSISTENCE UNDER GRAZING

The 2011 New Zealand Grassland Association paper titled "Improving red clover persistence under grazing", highlights the strengths of Relish red clover. This work by Ford and Barrett, assessed 142 red clover accessions replicated in mixed swards under cattle grazing. These included a collection of 99 experimental populations and cultivars brought into New Zealand in 2006, and 35 New Zealand derived breeding lines, including 16 F1 progeny lines developed by crossing ecotypes from countries including Portugal, Georgia, Yugoslavia and Turkey with elite New Zealand cultivars, and 19 synthetics including Grasslands Relish. Eight commercial red clover cultivars were included as controls.

Stage 1 trial of red clover evaluation in mixed sward, Manawatu

Relish grass mix

Figure 1: Average annual growth scores of visual yield, scored prior to grazing in replicated mixed sward plots[1]

Aorangi, Palmerston North

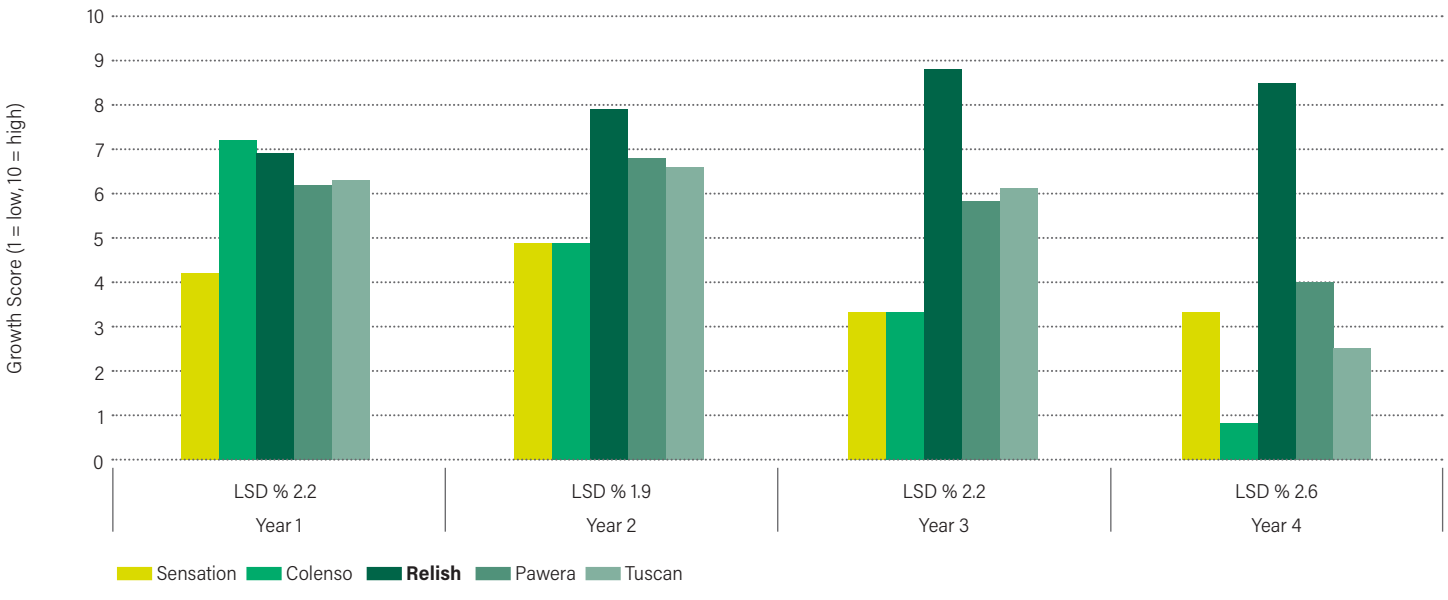


Figure 2: Plant survival (%) percentage of red clover plants surviving after three and a half years. Beef grazing in mix pasture[1]

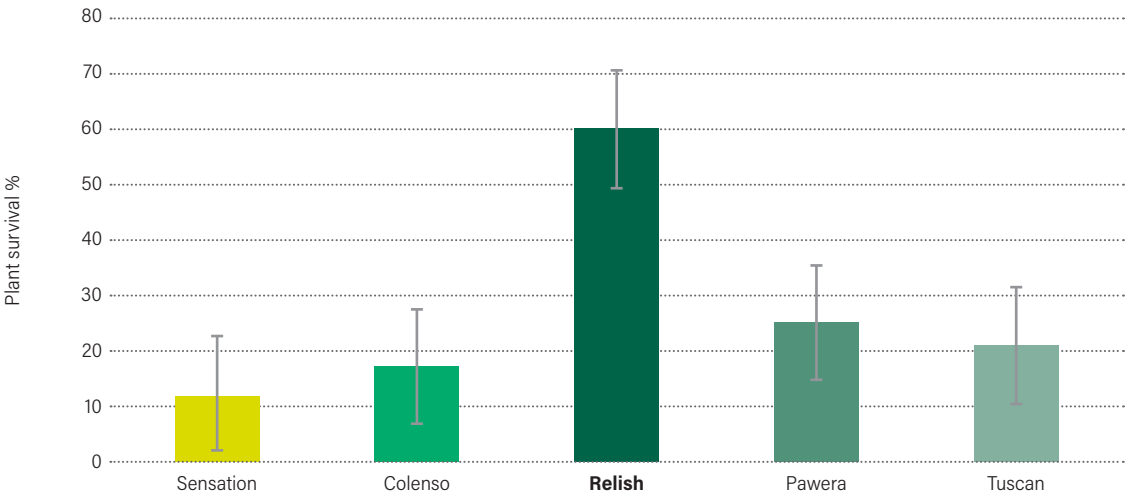


Table 1: Formonentin levels measured in a replicated plant trial in Palmerston North[1]

	CULTIVAR	FORMONENTIN (% DW)
Older cultivar	Pawera	0.27
	Colenso	0.18
Recent or current cultivar	Sensation	0.14
	Tuscan	0.25
New cultivar	**Relish**	0.10
	Mean	**0.17**
	LSD 5%	**0.12**

In this work Relish showed significantly (P<0.05) higher growth (Figure 1) and persistence (Figure 2) than all other entries over the three and a half years of the trial. Figure 1, 2 and Table 1 present the relevant commercial lines from this work. After three and a half years under grazing, 60% of the Relish plants were alive (Figure 2). This was more than any other entry, and significantly (P<0.05) more than any commercial cultivars in the trial.

[1] *Adapted from improving red clover persistence under grazing. Ford, et, al. (2011) Grasslands - Gisborne.*

RED CLOVER GROWTH CHARACTERISTICS

Relish red clover has been extremely successful on farm across New Zealand. Relish was awarded the AgResearch Impact Prize in 2018. Relish is highly productive in the spring, and its semi-erect growth habit makes it suitable for set stocked lambing (as early as September).

Kimihia Yielded Red Clover

Figure 3: Seasonal growth of red clover

Lincoln cut & carry, sown spring 2015

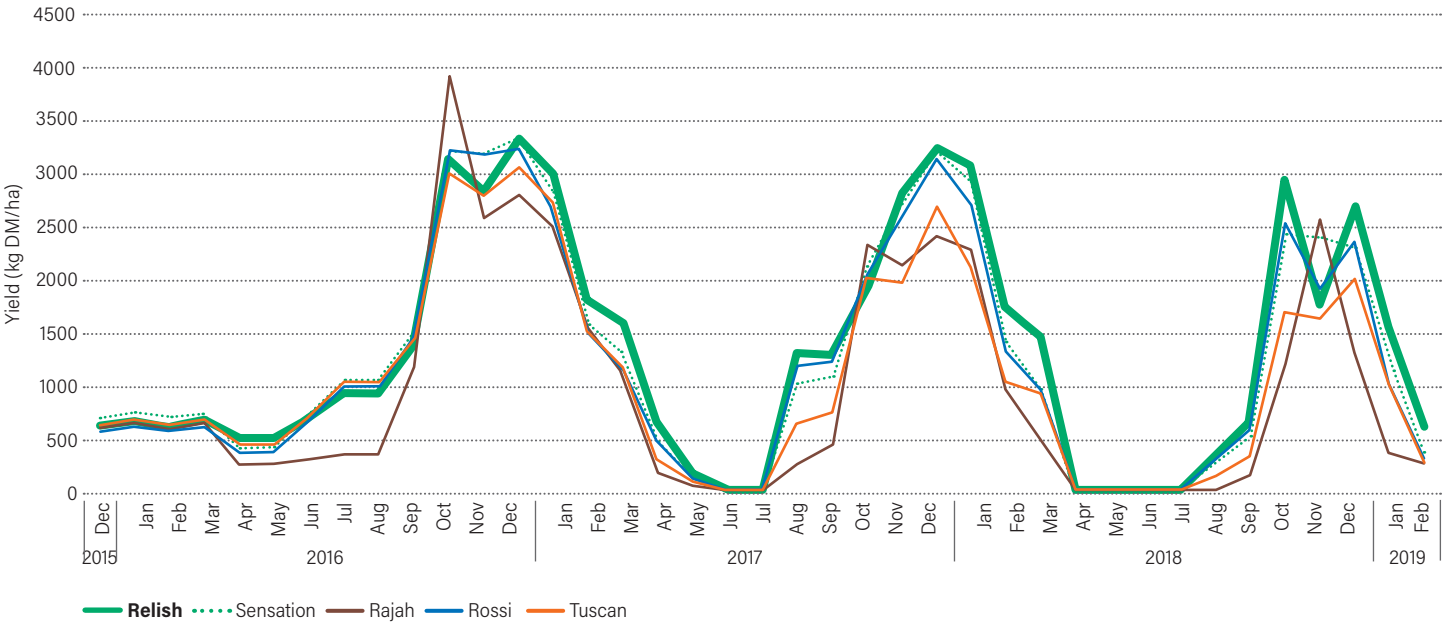


Figure 3 shows the seasonal growth habit of 5 different cultivars of red clover over 3.5 years in Canterbury. In the South Island, red clover does not have much winter growth, but milder winter climates will require grazing through winter.

Figure 4: Total accumulated yield (kg DM/ha) under a cut and carry system

Lincoln cut & carry, sown spring 2015

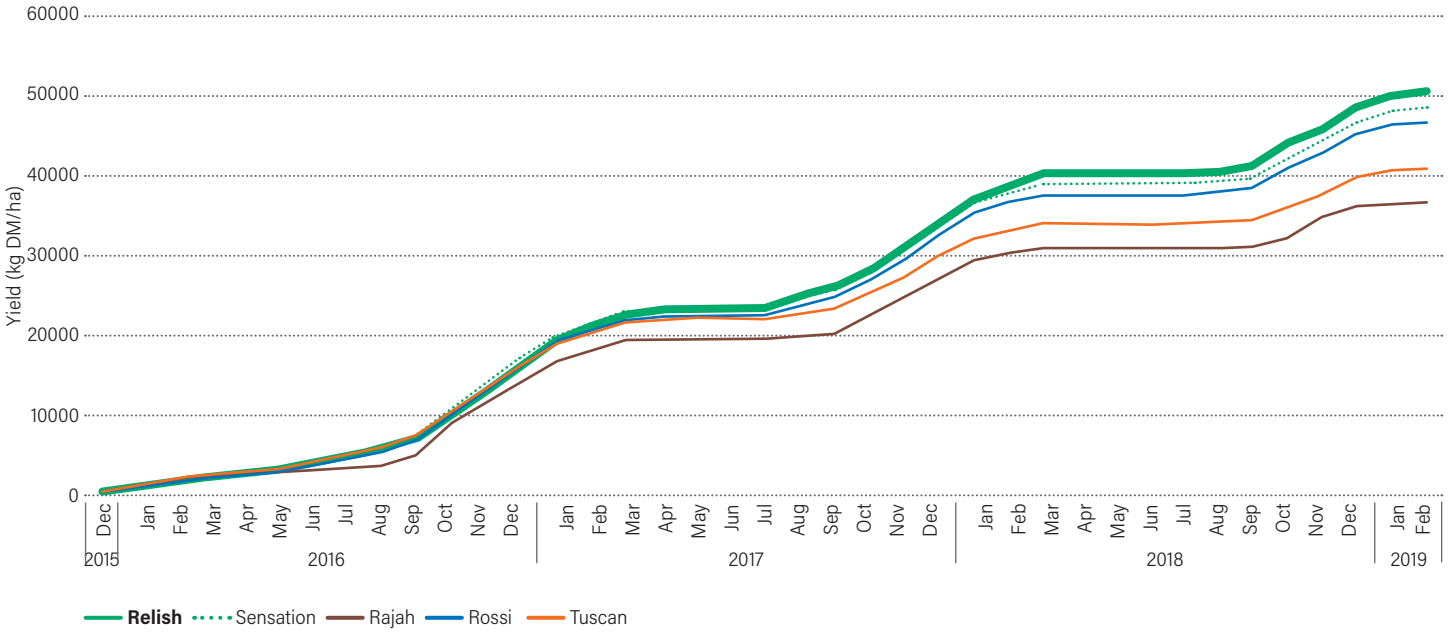
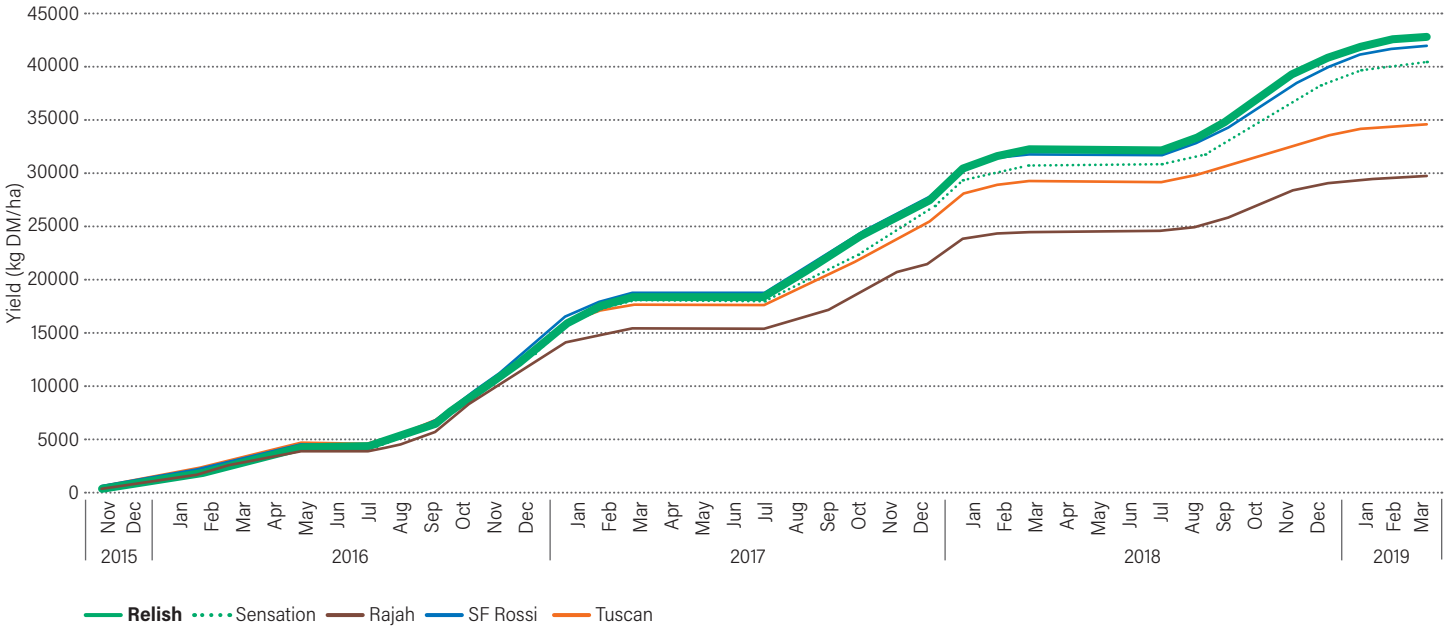


Figure 5: Total accumulated yield (kg DM/ha) under a rotational grazed sheep system

Lincoln rotational grazing, sown spring 2015



Figures 4 and 5 show the accumulated yield of different cultivars of pure stand red clover for 3.5 years. These were two separate replicated trials, but under different management. One trial was measured under a cut and carry system, and the other a rotational sheep grazed system, with the yield measurements taken prior to grazing. Under both managements, the first year total yield was very similar between all varieties, and it is not until the second year of growth where the differences in yield start to occur.

This work (Figures 4 and 5) shows similar results to that of Ford and Barrett (2011), with the benefits of Relish starting to separate from other genetics after year 1 (Figure 1).

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ACCELERATED AGING RED CLOVER RELISH & SENSATION

A red clover and lucerne trial was drilled in spring 2015. For year one, this had a standard management and was rotationally grazed. To demonstrate accelerated aging of these plots and put the cultivars under intense pressure, sheep were set stocked on the red clover and lucerne trial from the 27th January 2017 – 5th May 2017, for a total of 98 days.

19th January 2017: Before set stocking

15th March 2017: Day 47 of 98

7th April 2017: Day 70 of 98

Figure 6: Persistence score (20/07/2017) following intense set stocking for five months

1 = Complete plot death / 9 = Full plot survival

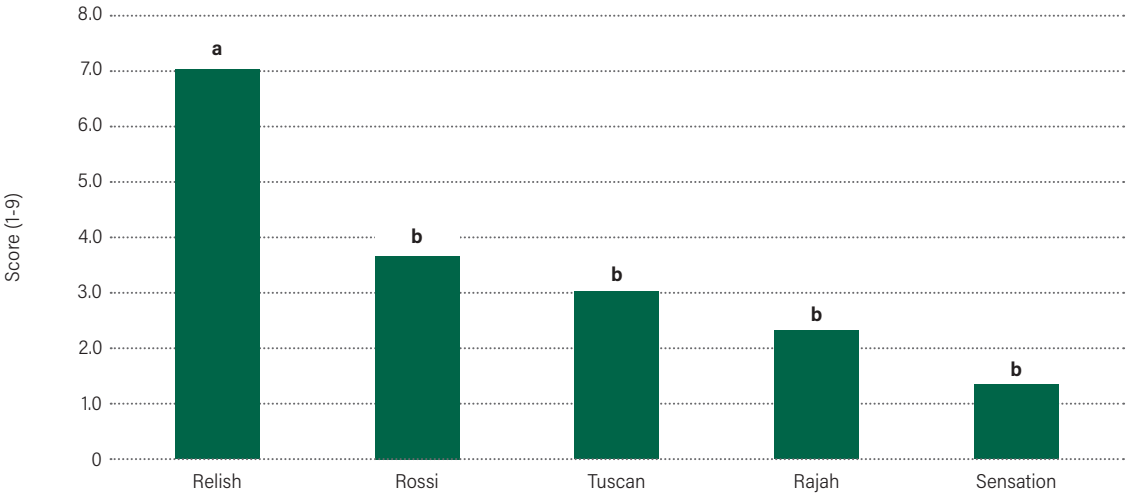

Figure 6 represents the ability of different red clover cultivars to survive under set stocking with sheep. This persistence also results in associated yield and production differences.

The photo to the right shows the difference between some of these plots in spring 2017. There is a significant yield advantage in favour of Relish red clover. On the 16th October 2017 a one off yield measurement was taken, resulting in Relish having grown 1,753 kg DM/ha. The next closest cultivar grew 682 kg DM/ha less than Relish and the lowest yielding cultivar grew 1,285 kg DM/ha less than Relish.

11 October 2017 (Relish left, Sensation right)

ASSET & RELISH MIX TRIAL
SOWN: 22ND MARCH 2017

Figure 7: Total yield of Asset AR37 with and without Relish red clover with no fertiliser inputs other that 150kg/ha DAP at sowing. (17th Aug 2017 - 21st June 2019)

Soil potentially available N was 50 kg/ha as of October 2018

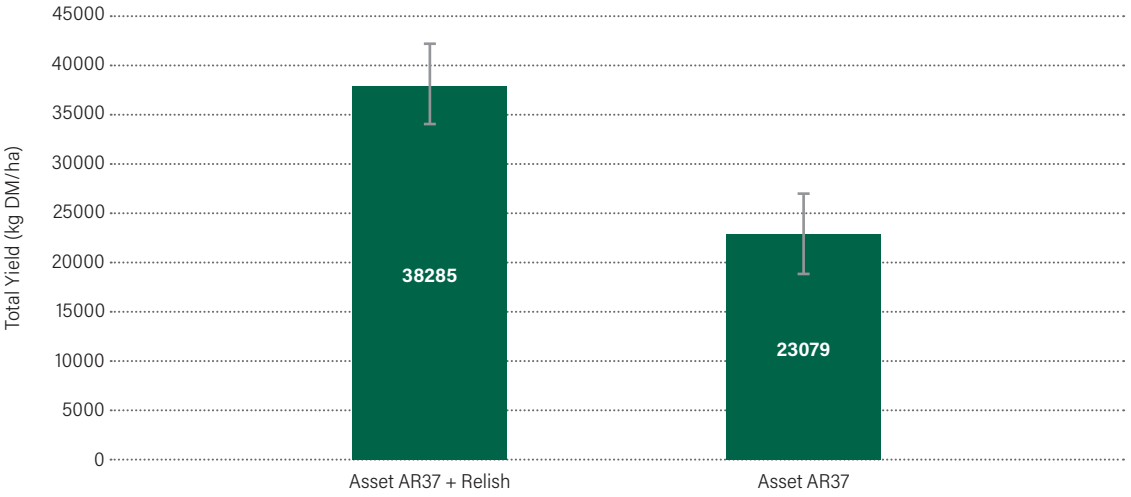

Figure 7 shows a difference in yield of 15,206 kg DM/ha over a two year timeframe for the same amount of inputs, this highlights the potential of Relish's nitrogen fixation ability and how significant it can be in low N environments.

Birds eye view of the Asset and Relish mix trial on the 12 March 2018.
The Asset AR37 with Relish red clover plots are very visual, compared to the other treatments.

Note: Plots with a red square around them are Asset AR37 and Relish

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ASSET & RELISH MIX TRIAL
SOWN: 22ND MARCH 2017

Figure 8: Average monthly yield (kg DM/ha)

Under different nitrogen applications commencing 1st October 2018

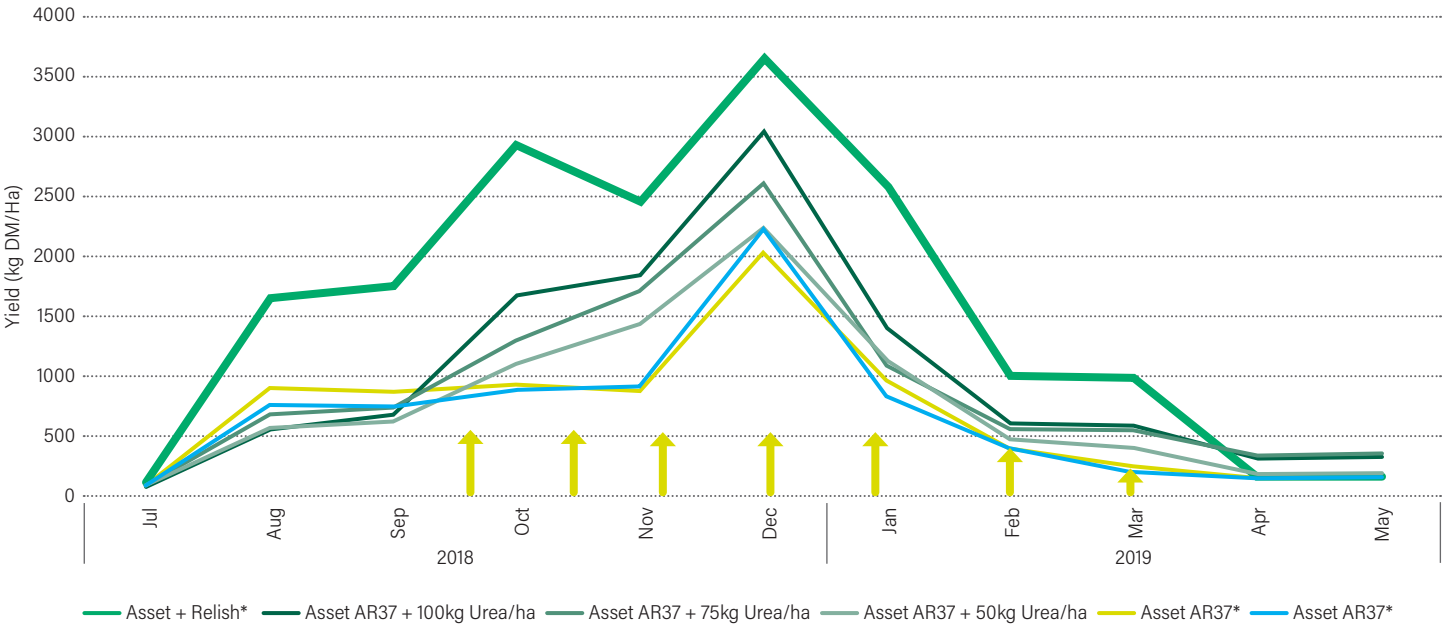


Figure 8 shows the monthly yields of different treatments. Each arrow represents a harvest date and therefore a treatment application. e.g. Asset AR37 with 100 kg urea/ha received seven applications of urea at 100 kg/ha.

**Asset AR37 + Relish received no fertiliser, as well as two straight Asset AR37 plots.*

Figure 9: Total yield from 1st October 2018 - 21st June 2019 under different fertiliser regime's

Soil potentially available N was 50kg/ha as of October 2018

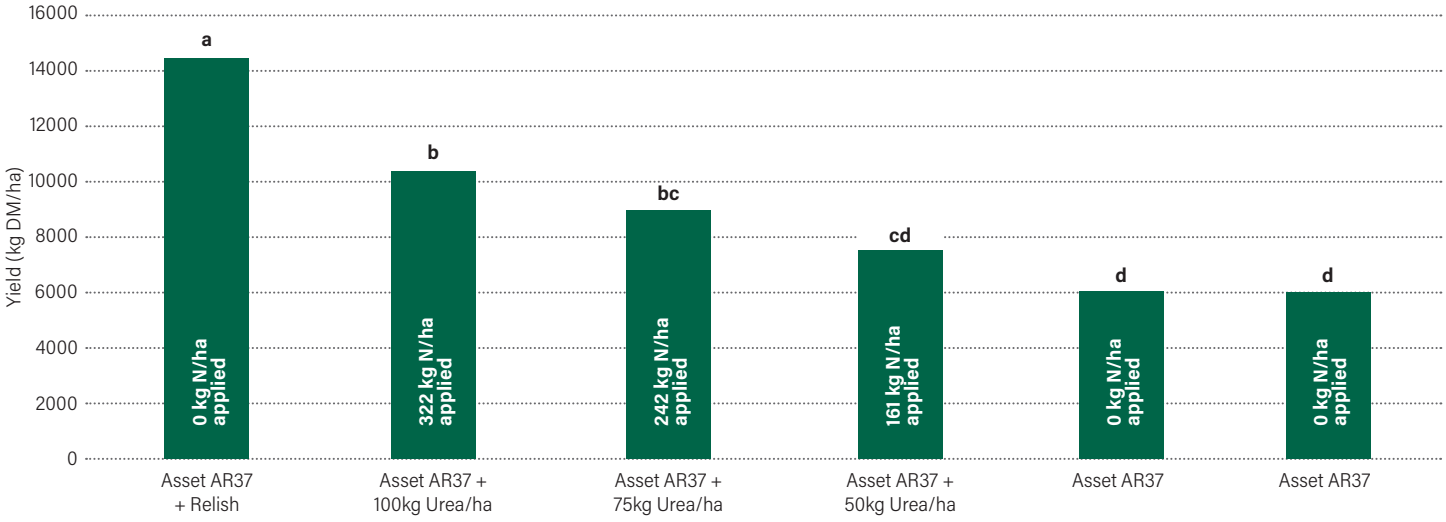


Figure 9 shows the total yield achieved over seven harvests. After each harvest each plot received the above treatment. e.g. Asset + 100 kg ureas/ha, received a total of 700 kg urea/ha for the period of the trial.

THE RELISH ADVANTAGE TRIAL

With environmental considerations becoming more of a focus for many farmers across New Zealand, there has been a growing need to deliver sustainable and resilient forage systems.

A multi-year and multi-site analysis looked at the level of production attainable in high-legume-content pastures, when compared with synthetic nitrogen. It also investigated how nutrient input affected feed quality.

Trial Introduction:

In the 2019 season Agricom's Regional Extension Agronomist's established a series of three Relish Advantage trials. The sites in the Manawatu and Canterbury were established in March 2019, with the Southland site established in December. All sites were managed with a cut and carry system to take away the variation in nutrient transfer if grazing with animals. The primary treatments of the trial were with or without fertiliser in addition to with or without legume. The trials were conducted for three years; within this time drymatter production, seasonal feed quality and botanical composition were measured. Further to this we measured soil nutrient status across the 3 years. Due to time of sowing the site in northern Southland still has 12 months to run.

Visual of Canterbury trial, photo taken spring 2020

THE RELISH ADVANTAGE TRIAL

Grasslands® Relish Red Clover

Figure 10: Three year combined accumulated yield (kg DM/ha) of the Manawatu and Canterbury trials.

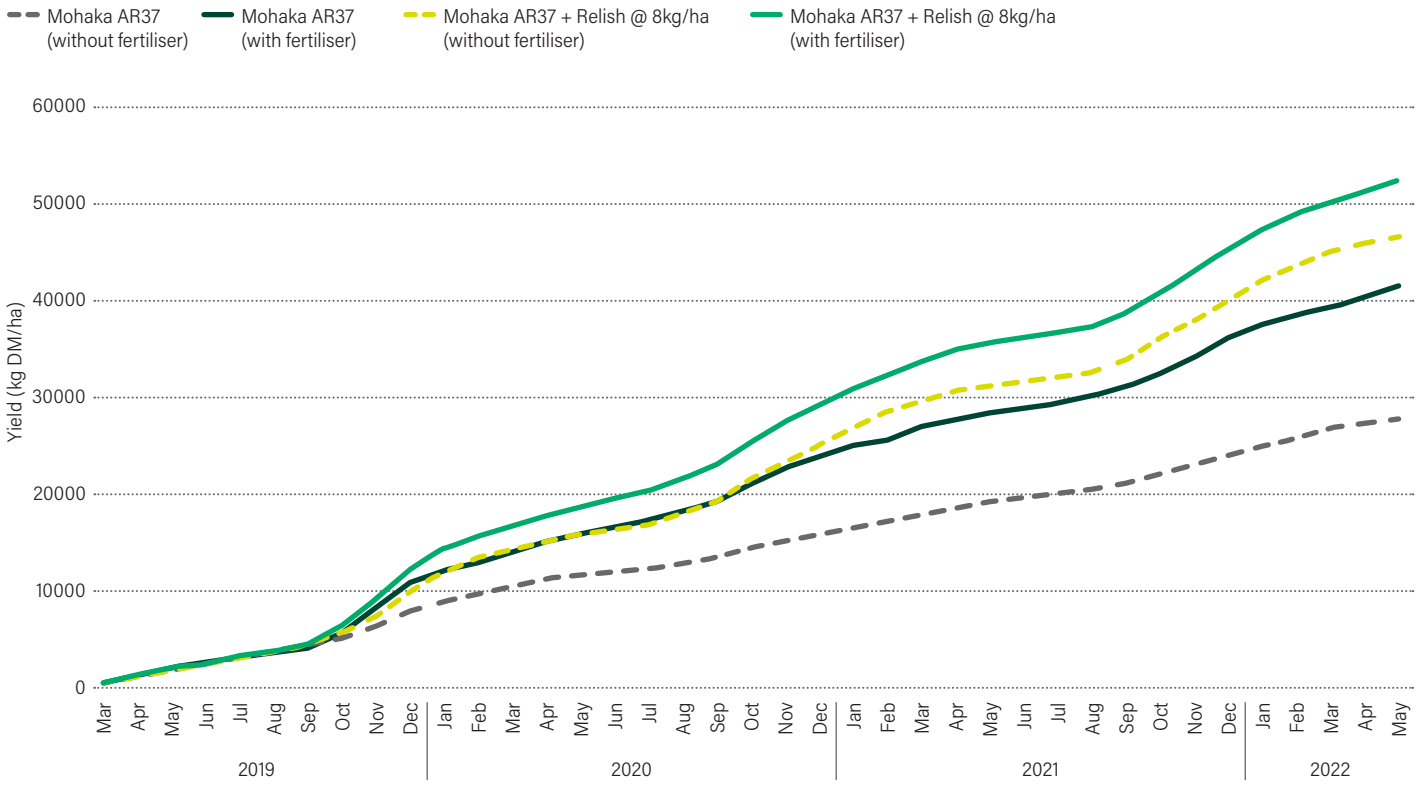
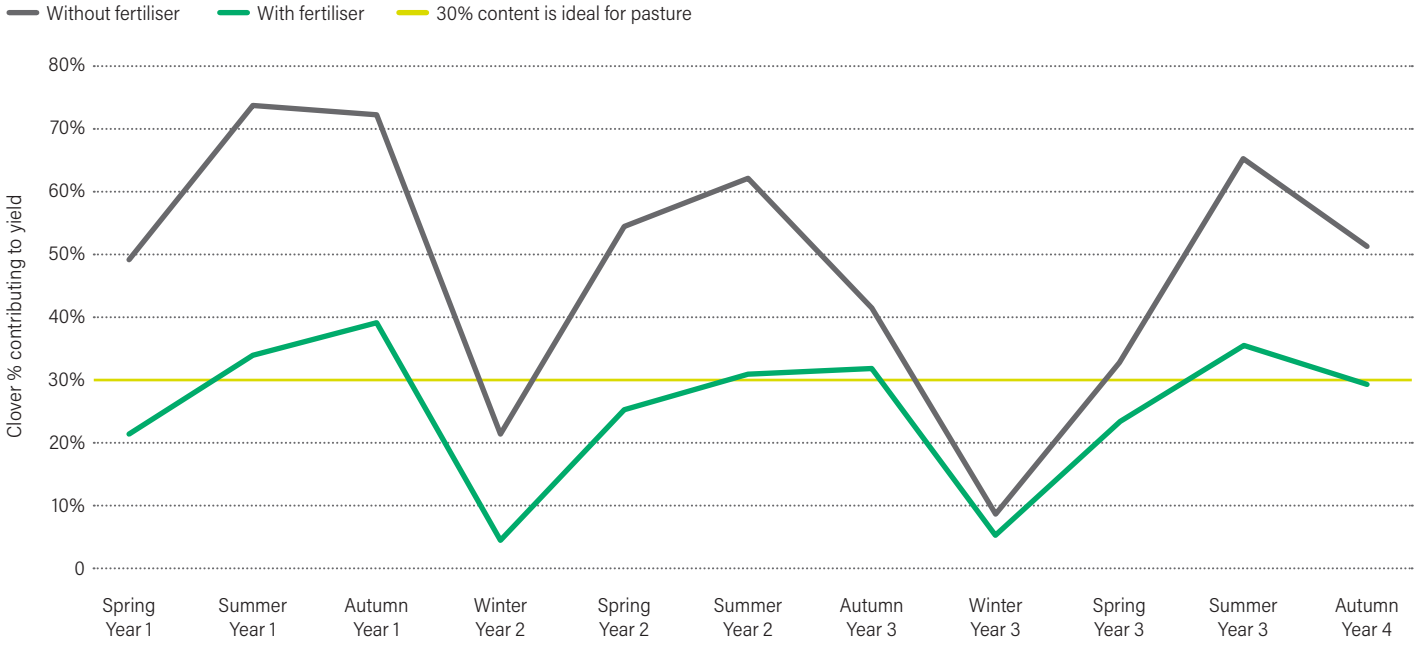


Figure 11: Seasonal Legume content of Mohaka + Relish @ 8kg, with and without fertiliser



THE RELISH ADVANTAGE TRIAL

Table 2: Average Seasonal Yield (kg DM/ha), Crude Protein Percentage (CP%) and Metabolisable Energy (MJ ME/Kg DM) across all three sites. Three years of combined data for Manawatu and Canterbury, and two years for Southland.

	WINTER			SPRING			SUMMER			AUTUMN		
	kgDM/ha	CP%	ME	kgDM/ha	CP%	ME	kgDM/ha	CP%	ME	kgDM/ha	CP%	ME
Mohaka No Fert	849	20	10.9	2840	17	10.9	2919	16	10.5	1396	20	10.3
Mohaka + Relish 8kg No Fert	920	27	11.2	5537	24	11.2	5921	24	10.5	2025	27	10.6
Mohaka + Fert	1225	22	11.1	5292	17	11.1	4653	17	10.6	2268	22	10.6
Mohaka + Relish 8kg + Fert	1264	24	11.3	6477	21	11.3	6040	20	10.7	2547	26	10.8

Summary

Adding both legume and fertiliser increased not only total drymatter production (Figure 10), but also the nutritional value of the pasture (Figure 10 and Table 2). When Relish or fertiliser was added to the pasture mix/sward separately, total yield over 3 years was increased by 18,820kg DM/ha & 13,691 kgDM/ha respectively. When both Relish and fertiliser were added together to the pasture mix/sward, yield was increased by 24,557 kgDM/ha over 3 years.

Fertiliser use and season had a significant effect on the clover percentage of the pasture. Even in the fertiliser treatments, clover proportions remained in excess of 20% across spring, summer and autumn (Figure 11). During the winter months clover shut down and contributed very little to total drymatter production across all treatments.

Based on the extensive work undertaken by the Agricom extension team, it can be concluded that the addition of Relish red clover in pasture can significantly increase overall production and potential profitability of a farming system regardless of fertiliser practice.

OUR REPRESENTATIVES

AGRONOMIC LEADERSHIP FROM OUR R&D TO YOUR FARM.

Cassey Edgcombe
Upper North Island
Territory Sales Manager
027 247 9189

Jaimin Benton
Central North Island
Territory Sales Manager
027 706 6309

Dylan Moratti
Western North Island
North Island Sales Lead
027 550 4085

Kris Bailey
Northern South Island
Territory Sales Manager
027 229 5776

Georgia Massie
Eastern North Island
Territory Sales Manager
027 705 0664

Matt Cooper
Central South Island
Territory Sales Manager
027 590 8064

Central Otago
Territory Sales Manager
027 591 8712

Jim Beer
Southern South Island
Territory Sales Manager
027 226 2777

Mark Brown
Australasian Brand Manager
027 220 4110

Allister Moorhead
Product Development Manager
027 433 7739

Glenn Judson
Animal Nutritionist
027 490 2033

Kaylee Spain
Nutrition Scientist
027 952 2845

Fraser Harrison
South Island Forage Systems Specialist
027 404 5513

Angee Nagra
Upper North Island Extension Agronomist
027 216 8970

Kylie Dobbs
Lower North Island Extension Agronomist
027 335 3311

Luke Visser
Northern South Island Extension Agronomist
027 541 2232

Greg Dunshea
Central South Island Extension Agronomist
027 670 9776

Sam Anderson
Southern South Island Extension Agronomist
027 405 7195

Holly Stokes
Extension Agronomist
027 229 7131

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