# Northland Beef Profit from Pastures Group

## How to grow and utilize more pasture to increase profit

RB98, April 2026

## Background

This group operated over 3 years (2016-18) to investigate how to grow & utilize more pasture and test whether these strategies translate into more profit.

The inspiration for the group came from the dairy industry, where pasture eaten is a key measure of farm performance (and closely linked to profitability). Pasture eaten on Northland dairy farms averages 9.8 tDM/ha (DairyBase), with the top 20% harvesting 12.5 tDM/ha. In contrast, a beef farm with a stocking rate of 10 SU/ha will be harvesting around 5.5 tDM/ha.

**Key Goal:** Identify strategies that lift pasture eaten from **May to December** by 1,000 kgDM/ha on Northland farms

- **1,000 kgDM/ha @ 30 cents/kgDM = $300/ha more revenue**

### Why May to December?

- More reliable pasture growth from May to December – less variation between years (compared to summer & autumn)
- Trading farms make most of their revenue during this period – often 70-80% of annual farm revenue (based on long term price trends)

### Why Pasture Management?

- Dairy farms have a significant gap between the Average and Top 20% - often this difference comes down to pasture management
- There's scope to increase pasture growth and utilisation at low cost – just by managing pasture slightly differently
- Piggybacking on what the dairy farmers have learned about pasture management can lift profitability on beef farms


### Acknowledgements

Thanks to the project funders Beef + Lamb New Zealand and sponsors Hine Rangi Trust and the Northland Beef Producers Trust. Thanks to all the farmers involved, especially those farmers who hosted demonstrations on their farms and/or field-days (Dennis and Rachelle O'Callaghan, Peggy and George Morrison, James Donaldson, Scott Blair, Te Aupouri, Landcorp Rangiputa, Geff Cookson, Bryce & Karen Wigley and Dave Gray). Thanks to Chris Boom from AgFirst Northland for demonstration design, monitoring, analysis and advice. Thanks to Laurie Copland for his years championing beef farming in Northland.

Gareth Baynham, AgFirst Northland, Project Facilitator.

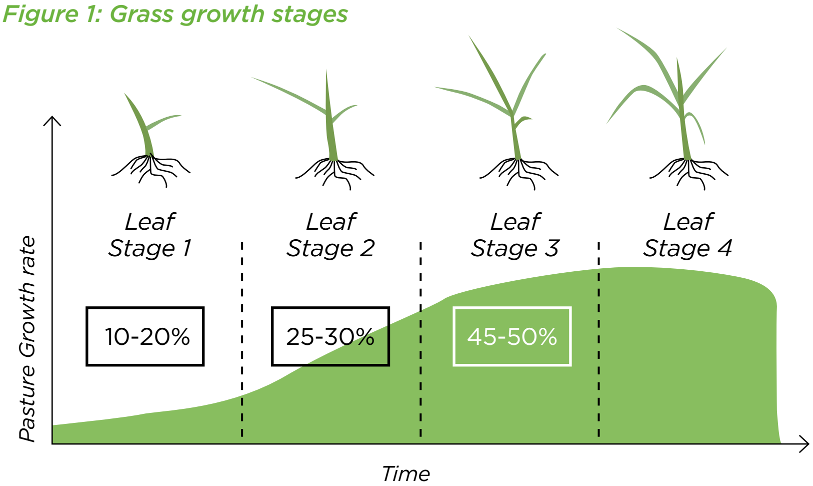
# Principles of Pasture Management

### 1. Grass Grows Grass

The boxes show the percentage of total growth for each leaf stage – as leaf area increases, more sunlight is captured, and growth rates increase. In rough numbers, the pasture growth rate doubles for each leaf stage – Daily growth at the 3rd leaf stage can be 4 times more than at the 1st leaf stage!

In winter a new leaf appears every 20-30 days, so a rotation length of 60-90 days means pastures are grazed at the 2 ½ - 3 leaf stage. Generally, faster rotations will grow less grass (especially in winter).

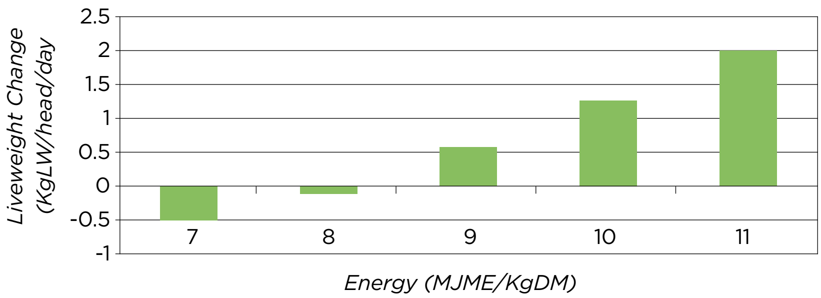
*Figure 1: Grass growth stages*




### 2. Feed Quality:

Figure 2 demonstrates the effect of feed quality (MJME/kgDM) on a 300 kg Steer being fed ad-lib (unrestricted) on pasture of different quality. Low quality pasture takes longer to digest, so they eat less in a day, and liveweight gain is slower. This has huge implications for Northland farms with kikuyu.

*Figure 2: Effect of feed quality on liveweight gain of 300kgLW steer*




These simple principles set the basis for the demonstrations:

- How can we grow more grass and harvest more pasture?
- How can we improve pasture quality?
- Does this translate to more profit?

Most of these demonstrations were on efficient beef systems running bulls:

- Run as self-contained "farmlets" to monitor pasture growth and quality as well as animal performance and profitability
- Bull systems have relatively small mobs allowing comparison of multiple strategies and get replication of the results

These strategies apply equally well to other beef farming options – running larger mobs should make it easier to implement these strategies.

# What we learned:

## 1. Winter Rotation Length - The Faster You Go, the Bigger the Mess!

Faster winter rotations resulted in less pasture growth, lower pasture cover and more pugging

**Rotation Grazing was Superior to Set Stocking:**

- 29% more pasture harvested (1.1tDM/ha more)
- 50% less pugging damage
- 60% more live-weight gain
- $547/ha more income (75% more income)

**60-Day Winter Rotation was Superior to a 30-Day Winter Rotation:**

- 7% more Pasture Harvested
- 44% more Live-weight Gain
- $212/ha more income (44% more)
- Better pasture quality in winter & spring

Rotation length is a key tool to increase pasture growth for many farmers in the group – it's the easiest way of keeping more pasture cover in the 2-3 leaf stage. In practice this means slow winter rotations (60 days or more), then speeding up to 30 days as pasture growth increases in spring. Generally, this means having more paddocks/breakfeeding, or having bigger mobs, or both.

Most of the group shift their mobs every 2nd day – so they need 30 "winter" paddocks to get a 60-day rotation. Often this is 15 permanent paddocks per mob, which get cut in half for winter.

## 2. Managing Kikuyu in the Autumn is Worthwhile

Mowing or mulching delivered better results than hard-grazing. When compared with no Kikuyu control:

- Hard grazing increased liveweight gain by 18%, Mowing or Mulching increased liveweight gain by 35%
- There was a net financial benefit of ~$150/ha (40%) for hard grazing or mulching compared to no kikuyu control
- Mowing had the highest net financial benefit of ~$240/ha (60% more) because of the lower cost (relative to mulching)

Managing kikuyu in autumn sets the platform for winter and spring – both for pasture growth and feed quality.

When Kikuyu is growing quickly (e.g. Autumn 2018) it's challenging to control kikuyu across the whole farm, so plan to use different options for different parts of the farm e.g. mowing/mulching on the flats & hard grazing on the hills.

Choosing to do nothing to manage kikuyu is an option, but this demonstration indicated it's the most expensive option.

## 3. Stocking Rate & Pugging

Northland is prone to wet winters – pugging has been an issue on many of the demonstrations.
We investigated strategies to reduce pugging:

**Different Stock Classes (R1 vs R2):** A 2017 demonstration comparing R1 & R2 cattle showed major difference in production, profit and pugging

- More pugging with the R2 Cattle (78% pugged for R2 vs 50% for R1)
- Pasture cover was similar for both classes
- Production was good on both systems, but the R1 cattle liveweight gain was exceptional (941 kgLWG/ha) - 72% more than the R2 cattle
- Using Long Term pricing, the revenue was 30% greater for the R1 Cattle
- Pugging will have contributed to this difference in performance.

**Different Stocking Rates of the same stock class and same liveweight per head**

- Low stocking rates had slightly less pugging than medium or high stocking rates
- Lower stocking rates had higher pasture cover and individual bull liveweight gain
- Overall production and revenue[1] per hectare were similar across all stocking rates in both seasons

*Table 1: Stocking rate and pugging*

| | Low SR | Medium SR | High SR |
|---|---|---|---|
| **R1 Bulls/ha** | **4** | **4.5** | **5** |
| Pugging % 2017 (Wet Winter) | 69% | 71% | 74% |
| Pugging % 2018 (Drier Winter) | 38% | 44% | 44% |
| 2017 Liveweight gain(kgLWG/head) | 192 | 174 | 164 |
| 2018 Liveweight gain (kgLWG/head) | 135 | 127 | 117 |
| Production 2017 (kgLWG/ha) | 776 | 785 | 818 |
| Production 2018 (kgLWG/ha) | 548 | 576 | 583 |

[1] *Based on the same sale price per kgLW across all treatments*

**Same stocking rate (kgLW/ha) but different liveweight (kgLW/head) of the same stock class**

- o Comparison of R2 Bulls which were Light (373 kgLW), Medium (432 kgLW) or Heavy (463 kgLW) all stocked at 1000 kgLW/ha
- o The smaller bulls harvested 6-10% more pasture, had higher liveweight gain per hectare (4-31%) and production (14%) than the medium or large bulls
- o The smaller bulls generated slightly more revenue per hectare (5-9%)
- o There was slightly less pugging and hole digging with smaller bulls

**Variable Stocking Rate through the Season**

- Having a lower stocking rate through winter, then topping up with extra cattle in spring (Variable SR) was compared with a higher stocking rate all winter and spring (High SR) in two years
- Pugging was lower on the Variable SR treatment (20-50% less pugging) and pasture cover was higher through spring, especially in a wet year
- Liveweight gain per hectare was higher on the Variable SR (3-26% more) but the premium paid for extra cattle in the spring meant revenue varied between the years (-24% to +22%)
- In a bull system it can be challenging to mix mobs, so there are some logistical challenges when adding the extra bulls in spring
- Adopting the Variable SR reduces risk of pugging and winter feed deficit, but introduces risk of a purchase premium in spring

**4. Annual/Italian Ryegrass:**

Sowing annual (or Italian) ryegrass into kikuyu is a popular option with dairy farmers to boost winter pasture growth. Two demonstrations indicated:

- Annual ryegrass increased pasture growth and pasture cover
- Liveweight gain was greater (10-50% more), but most of this advantage was spent in buying and establishing the seed
- Both demonstrations were essentially break-even

## Demonstration 1: Kikuyu Management Comparison

**Location & Year:** Mar – Dec 2016. Dennis & Rachelle O'Callaghan, Temataa Station, Taipa, Far North

**Summary: Kikuyu Management Comparison**

- Managing kikuyu quality in late autumn contributed to better pasture quality and animal production in winter and spring
- Mechanical control (mowing or mulching) had similar feed quality and production benefits, but the lower cost of mowing gave the greatest financial benefit
- Hard grazing with breeding cows generated around half the production benefit of mechanical control, but at a lower cost
- The high stocking rate and pugging may have impacted on the results
- Mulching may be preferable to mowing where kikuyu residue is very high or where Italian ryegrass is being mulched into pasture.

**Goal:** Compare the impact of three kikuyu management techniques (hard grazing, mulching or mowing) against no kikuyu management (control).

**Background:** Research on Northland dairy farms shows benefit from managing kikuyu in late autumn to encourage the emergence of temperate pasture species. This management generally involves removing kikuyu trash in late autumn to prevent kikuyu shading out other pasture species. This demonstration compared production and profitability of different kikuyu management options (mowing, mulching or hard grazing) compared with a control (no kikuyu control) in a beef farm context. The hypothesis was mechanical control would be the most productive and profitable option.

**Method:** 4 individual beef systems (6 ha per system) with similar soil and topography were identified. The soils were podzolized sandy loams (winter wet). Each system was operated as a self -contained farmlet stocked with 22-month bulls from 12th May until 1st December 2016. Kikuyu management treatments were applied to farmlets from mid-April. Once the bulls started on the systems (12th May) all systems received the same management (i.e. the same initial stocking rate, rotation length, shift frequency and nitrogen).

Pre-Trial Treatments:

Control (System1): This area was on a 30-day rotation through autumn (normal management) with no specific kikuyu management applied

Mowing (System 2) & Mulching (System 3) Treatments: Calves were grazed ahead of the mower (system 3) or mulcher (system 4). Paddocks were mown/mulched over 2 weeks from mid-April

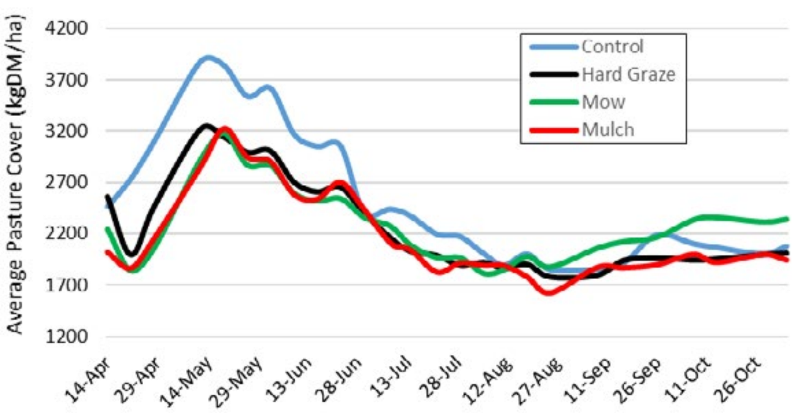
Hard Grazing Treatment (System 4): Cows hard grazed this treatment getting 2 days in each of the 15 permanent paddocks (allowance of 8-9 kgDM/cow/day) from mid-April to mid-May

**Results:** Bulls were stocked at ~3 bulls per hectare (~1350 kgLW/ha). The systems started on 12th May, initially on a 40-day rotation, then 60 days from late May, speeding up to 45 days on 25th August & 30 days from the 14th September to the end of the trial on the 1st December when all bulls were sold. Nitrogen was applied twice to all treatments (May & Aug @ 30kgN/ha/application).

Pasture cover was assessed weekly with a rising plate-meter, feed analysis and dissection was assessed 6 times and pugging visually assessed twice (July & Sept). Bulls were weighed at the start and the end of the demonstration.

**Results:** Pasture cover (Fig 3) was highest on the control farmlet (uncontrolled kikuyu), although this difference reduced as the winter progressed. From mid-winter the systems had similar pasture cover, with a trend of slightly higher cover in the mown treatment through late spring.

*Figure 3: Average Pasture Cover (kgDM/ha)*



Higher covers in the Control farmlet during late autumn were largely due to kikuyu stolon remaining in pasture through winter (Fig 4), which was reflected in the low feed quality (ME) results for the control farmlet (Fig 5). The other treatments had similar pasture quality through the demonstration. There was no major difference in pugging between the systems.

*Figure 4: % Dead Material*

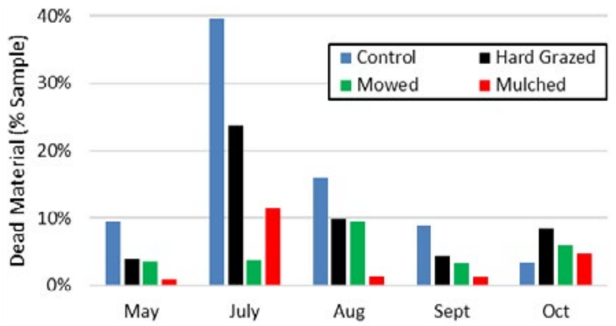
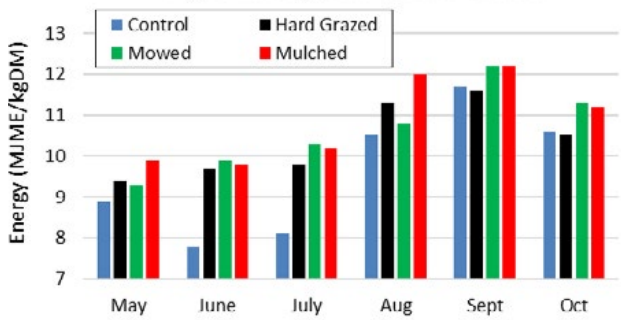



*Figure 5: Energy of Pasture Eaten*




Bull growth is summarized in Table 2.

*Table 2: Bull Production for each of the treatments*

| | **Start 12/5/16** | | **End (1/12/16)** | | **Net Gain[1] (KgCW per Ha)** | **Increase over control** |
|---|---|---|---|---|---|---|
| | **Liveweight** | | **Carcass Weight** | | | |
| Treatment | kgLW/hd | kgLW/ha | kgCW/hd | kgCW/ha | | |
| Control | 463 | 1355 | 284 | 832 | 154 | - |
| Hard Grazed | 452 | 1312 | 289 | 838 | 182 | 18% |
| Mowed | 459 | 1354 | 302 | 891 | 214 | 39% |
| Mulched | 443 | 1340 | 290 | 877 | 207 | 34% |

*[1] Net gain (kgCW/ha) assuming starting carcass weight at 50% of liveweight*

All treatments provided an animal growth advantage over the control. The relatively high stocking rate and low winter pasture cover may have masked some of the feed quality effects. The mown and mulched treatments generated ~35% more weight gain than the control, with the hard-grazed treatment 18% more than the control.

The financial comparison is outlined in Table 3 with mowing costs estimated at $70/ha (60% of the mulching cost). The hard-grazing treatment was not allocated a cost (assuming the cows were available for grazing).

*Table 3: Financial comparison of the kikuyu management options*

| | **Margin[1]** | | | **Treatment Cost $/ha** | **Net Margin (after treatment costs)** | | **Increase over control** |
|---|---|---|---|---|---|---|---|
| | **$/head** | **$/ha** | **$/ha Extra[2]** | | **$/ha** | **$/ha Extra[2]** | |
| Control | $136 | $397 | **-** | **-** | $397 | - | - |
| Grazed | $191 | $555 | **$158** | **$0** | $555 | $158 | 40% |
| Mowed | $241 | $710 | **$313** | **$70** | $640 | $243 | 61% |
| Mulched | $224 | $679 | **$282** | **$120** | $559 | $162 | 41% |

*[1] Purchase price of $2.93/kgLW and Sale price of $5.25/kgCW*
*[2] Extra revenue or margin relative to the control treatment*

The mown and mulched treatments generated $313-282/ha more revenue than the control treatment (71-79% increase), with the hard graze treatment around half that amount ($158/ha or a 40% increase). After deducting estimated treatment costs, the hard grazing and mulching treatments provided a similar net benefit of ~$160/ha (40% more) and the mown treatment ~$240/ha more than the control (60% more).

**Discussion:** 2016 was a relatively wet autumn, with favourable conditions for kikuyu growth. This demonstration indicated that improving kikuyu quality in late autumn contributed to better pasture quality and animal production in winter and spring, leading to increased profitability across all three treatments when compared to the control. The relatively high stocking rate may have impacted on these results – the difference in pasture quality may have a greater impact at lower stocking rates. These results correlate well with results from the dairy sector where mechanical control of kikuyu is widely practiced. This demonstration also highlights the cost of not being pro-active with kikuyu management – some beef farmers don't use kikuyu control options, but this likely creates a cost in lost production and revenue.

The mowing and mulching treatments resulted in similar feed quality and animal production benefits, but the lower cost of mowing resulted in greater financial benefit compared to mulching. Mulching requires a tractor with more horsepower (typically >100 HP). This demonstration indicates that for many beef farmers, mowing will be a practical and cost-effective option that compares well with mulching. Kikuyu had been regularly grazed through autumn in this demonstration – mulching may have been more effective if kikuyu had been poorly managed (e.g. if a large amount of trash had built up).

Hard grazing with breeding cows generated around half the production benefit of mechanical control, but with a lower cost. The cows lost condition while hard grazing kikuyu; thin cows may not be suitable for an extended period of hard grazing. Most farms won't have enough cows to control the whole farm (in a favorable autumn).

This demonstration indicates that while hard grazing is an effective control option, particularly for areas where mechanical control is not practical (due to topography or soil type), that it's best used alongside other options (such as mechanical control) on areas where winter and spring pasture growth and quality will be most beneficial.

## Demonstration 2: 30 vs 60 Day Winter Rotation (R2 Bulls)

**Location & Year:** Apr - Oct 2016, Peggy & George Morriso, Pukegreen, Kaingaroa, Far North


**Summary:** The demonstration finished in mid-October due to low pasture cover on the 30-day rotation, but for the first 180 days:

- The 60-day rotation had higher pasture cover, better winter pasture quality and 11% more pasture harvested
- Bulls on the 60-day rotation gained 38% more liveweight
- Slightly less pugging on the 60-day rotation



**Goal:** Compare the impact of a 30-day winter rotation with a 60-day winter rotation on pasture and animal production, profitability and pugging.

**Background:** Long winter grazing rotations grow more pasture. The hypothesis was the better pasture growth should translate into higher pasture cover and better animal growth on the 60-Day winter rotation.

**Method:** An existing cattle system was split into two smaller cell systems and stocked with R2 bulls (similar stocking rate and mob size) as outlined in Table 4:

*Table 4: Overview of the Demonstration*

| | 30-day Rotation | 60-day Rotation |
|---|---|---|
| Area | 7.3 ha | 7.5 ha |
| Bulls | 16 | 16 |
| Avg LW (26/5/16) | 491 kg/hd | 486 kg/hd |
| Bulls/ha | 2.2 | 2.1 |
| kgLW/ha | 1,076 | 1,036 |
| Breaks | 15 x 2-day shift | 30 x 2-day shift |

Both systems were mown to control kikuyu prior to the trial starting, neither area received nitrogen. The contour was flat in both systems, with relatively wet, pugging prone soils. Mobs were shifted every day during winter to help mitigate pugging damage.

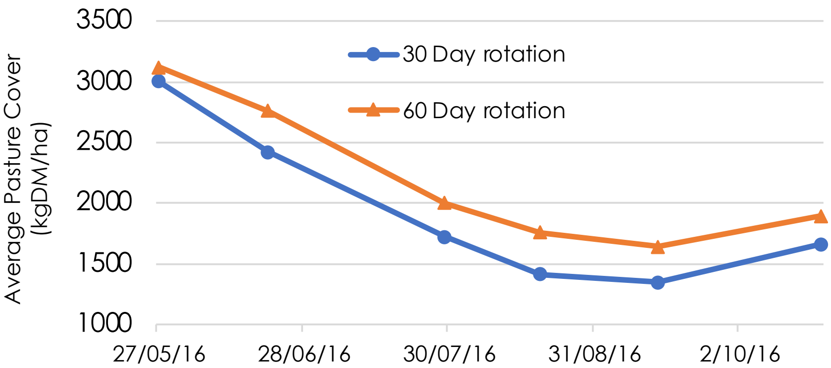
Pasture cover was assessed visually (pugging damage meant the rising plate meter was not accurate), pugging damage was assessed twice for each system (July & September). Pre-graze pasture samples were assessed for species composition (dissection) and feed quality (lab analysis).

- **30 Day System:** Started on 30 days on the 15th April, reduced to 28 days in August to avoid damaging pugged paddocks
- **60 Day System:** Started on 40 days on the 6th May (to control kikuyu), 60 days from the 26th May. Rotation was moved to 40 days on 1st September

The demonstration ended on the 9th in October (after 180 days) due to a lack of feed on the 30-day system.

**Average Pasture Cover:** Pasture cover was consistently 200-300 kgDM/ha lower on the 30-day rotation. Modelling the two systems on Farmax, indicated the 60-day treatment harvested 326 kgDM more than the 30-day treatment, which represents around ~11% more pasture eaten during the 180 day period.

*Figure 6: Average Pasture Cover – 30 vs 60 day rotation*



**Pasture Species & Feed Quality:** The 30-Day rotation had a higher proportion of low-quality kikuyu stem & stolon through winter (Figure 7). The 60-day rotation appeared to control kikuyu stolon on the first rotation, then had a higher proportion of ryegrass on subsequent rotations, which is reflected in the difference in feed quality between treatments from July (Figure 8).

*Figure 7: Kikuyu Stem & Stolon Dissection*

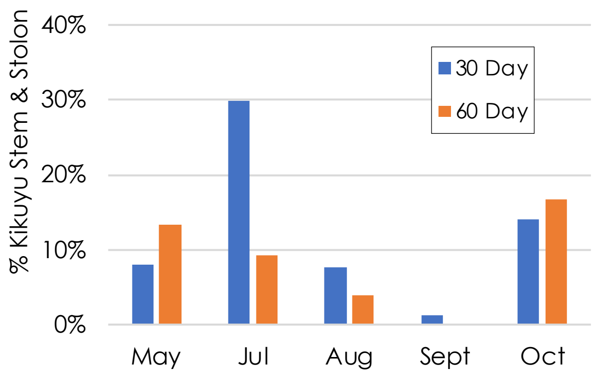
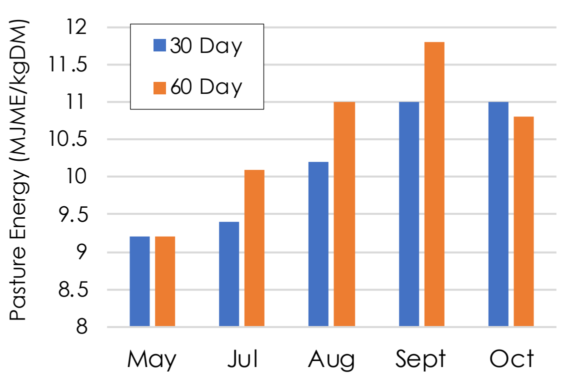



*Figure 8: Feed Quality (MJME/kgDM)*




**Pugging:** Both treatments had a high proportion of pugging damage, in the first July assessment the 30-Day treatment showed more pugging – presumably due to the number of grazing events. Continual rain through August and September meant both systems showed significant pugging at the September sampling.

*Table 5: Visual Pugging (% of 30 samples)*

| | 29/07/16 | 14/09/16 |
|---|---|---|
| 30 Day rotation | 72% | 65% |
| 60 Day rotation | 52% | 58% |

**Bull Liveweight:** The average bull liveweight for each treatment is outlined in Figure 9 and Table 6. Liveweight gain was greater in the bulls on the 60 day rotation from June.

*Figure 9: Average Bull Liveweight (kgLW/head)*

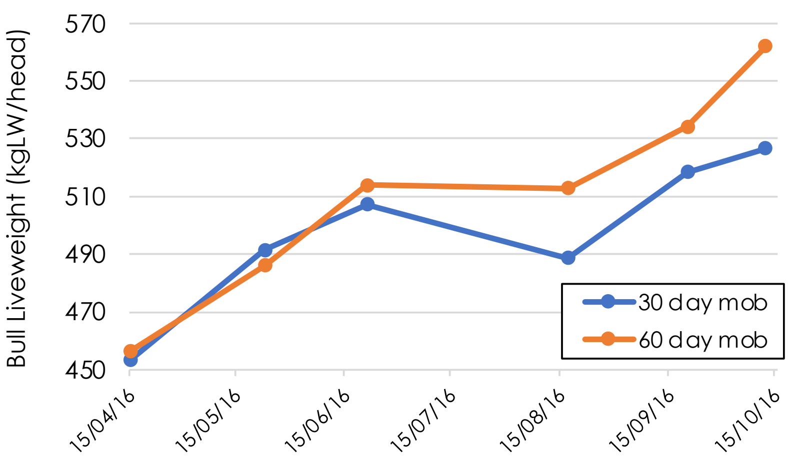


*Table 6: Animal Production Comparison (liveweight)*

| | Demonstration (Apr-Oct) | | | |
|---|---|---|---|---|
| | **Start** | **Finish** | **Liveweight Gain (kgLWG)** | |
| | **15/04/2016** | **9/10/2016** | **kgLWG/head** | **kgLWG/ha** |
| 30 Day | 453 | 527 | 74 | 162 |
| 60 Day | 457 | 562 | 105 | 224 |

Prior to trial ending in early October, the bulls on a 60-day rotation had gained 31 kgLW/head (62 kgLW/ha) more than the bulls on the 30 day winter rotation (38% more).

Table 7 outlines the potential financial differences assuming the bulls were sold at the end of the demonstration (in October) using both the 2016 market price and the long-term price (based on a long term price of $5/kgCW). In both scenarios, bulls on the 60-day winter rotation would be expected to generate ~$200/ha more revenue, or between 20% (long term prices) – 40% (2016 price) more margin than the 30 day rotation.

*Table 7: Indicative Margin ($) using 2016 and long-term pricing*

| | Demonstration (Apr-Oct)[1] | | | Long Term Prices ($5/kgCW) | | |
|---|---|---|---|---|---|---|
| | **Start** | **Finish** | **Revenue** | **Start** | **Finish** | **Revenue** |
| | 15/04/2016 | 09/10/2016 | $/ha | 15/04/2016 | 09/10/2016 | $/ha |
| 30 Day ($/hd) | $1,360 | $1,580 | $484 | $1,087 | $1,502 | $912 |
| 60 Day ($/hd) | $1,370 | $1,686 | $696 | $1,096 | $1,602 | $1,112 |
| Difference ($/ha) | $21 | $233 | $212 | $20 | $220 | $200 (+22%) |

*[1] 2016 Actual Prices: Bulls valued at $3/kgLW at start and finish of Demonstration*
*[2] Long Term Prices ($5/kgCW): Bulls valued at $2.40/kgLW in April and $2.85/kgLW in October)*

**Discussion:** This demonstration confirmed that a longer winter grazing rotation contributes to better pasture growth and this can be captured as better animal production and revenue per hectare, confirming the hypothesis.

This demonstration highlighted the impact of a longer grazing rotation on pasture growth (quantity). Pasture covers and animal growth were consistently higher in the 60-day rotation, suggesting higher pasture growth. We expect this higher pasture cover to capture more sunlight, contributing to better pasture growth. The longer interval between grazing events reduces opportunity for pugging damage and the impact of overgrazing.

Pasture quality was also impacted by the grazing rotation; harder grazing of kikuyu dominant pasture on the 60-day rotation (during the first rotation) removed more kikuyu stem and stolon, encouraging the emergence of temperate grasses. These temperate pasture species generally have greater pasture growth potential in winter and better pasture quality.

The combination of better quality pasture and higher pre-graze covers resulted in superior liveweight gains during late winter and early spring in the 60-day rotation.

2016 was a particularly wet autumn and winter, contributing to greater pugging damage. The decision to end the demonstration early (in October rather than December as initially planned) reflects the farmers concerns around low pasture cover, pugging and lower liveweight gains in the 30-day rotation. Extra area was added to the 30-day rotation system to compensate for lower pasture covers, effectively ending the comparison.

Grazing rotations less than 60 days in winter (i.e. more frequent grazing intervals) likely reduce pasture growth rates compared to longer rotations. Reducing stocking rate may be an appropriate response to shorter winter grazing rotations.

## Demonstration 3: Set Stocking vs Rotational Grazing (R1 Bulls)

**Location & Year:** Jun – Nov 2016, James Donaldson's Farm, Portland, Whangarei

**Summary:** Relative to set stocking, rotational grazing:

- Harvested 1.1 tDM/ha more pasture
- Had 50% less pugging damage
- Had 60% more Liveweight gain per hectare
- Had 65-100% more revenue per hectare

**Goal:** Compare the impact of set stocking versus rotation grazing (58-day winter rotation) on pasture and animal production, profitability and pugging.


**Background:** Long winter grazing rotations grow more pasture. The hypothesis was rotationally grazed systems would be more productive and profitable with less pugging damage.

**Method:** Two adjacent areas of a farm were allocated into either a set stocked system or a rotationally grazed system as outlined in Table 8. The set stocked area was two paddocks (with the gate open between paddocks). The rotationally grazed area was subdivided into 19 cells using "sticks and string" electric fencing (fibreglass rods and polywire) with portable troughs.

*Table 8: Overview of the Demonstration*

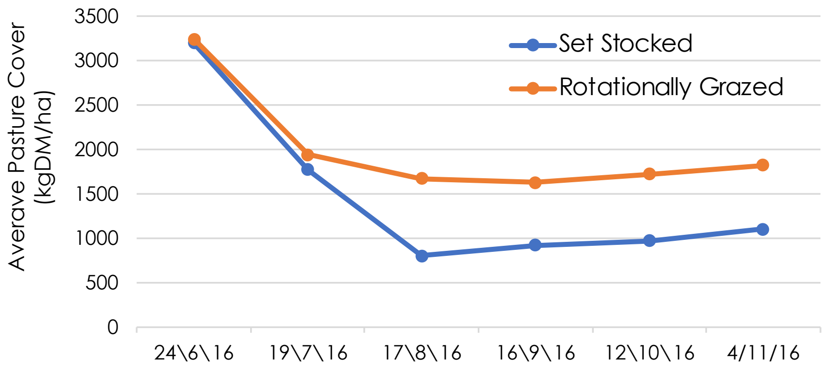
| | Set Stocked | Rotationally Grazed |
|---|---|---|
| Area | 5.0 ha | 5.2 ha |
| Bulls (R1 Friesian) | 22 | 24 |
| Avg LW (19/6/16) | 183 kg/hd | 174 kg/hd |
| Bulls/ha | 4.4 | 4.6 |
| kgLW/ha | 805 | 804 |
| Cells/"paddocks" | 1 | 19 |
| Winter Rotation | Set Stocked | 58 (3-day shifts) |
| Spring Rotation | Set Stocked | 19 (daily shifts) |

Both systems started on the 19th June. The rotated bulls stayed on a 58-day rotation until 25th July, moving to a 38 day rotation (2 days per cell), then a 25-30 day rotation from the 1st September. A total of 71 kgN/ha was applied to both systems split over three applications (July, August and October). The demonstration concluded in early November (141 days) due to low pasture cover on the set stocked system.

Pasture cover was assessed visually (pugging damage meant the rising plate meter was not accurate), pugging damage assessed twice for each system (August and September). Pre-graze pasture samples were assessed for species and composition (dissection) and feed quality (lab analysis).

**Average Pasture Cover:** From late July average pasture cover was consistently 700-800 kgDM/ha lower on the set stocked rotation (Figure 10). Farmax analysis shows the rotationally grazed system harvested 4.9 tDM/ha, compared to the set stocked system harvesting 3.8tDM/ha, or 1,100 kgDM/ha more than the set stocked system, an increase of 34% above the Set Stocked system.

*Figure 10: Average Pasture Cover (Visual Assessment)*




**Pasture Species & Feed Quality:** The Set Stocked system had more low-quality kikuyu stem & stolon through winter when compared with the Rotationally grazed system (Fig 11). Presumably the rotationally grazed animals controlled kikuyu more effectively on the first rotation, then had a higher proportion of ryegrass on subsequent rotations, which is reflected in the difference in feed quality (MJME/kgDM) between treatments in August (Fig 12). From September pasture quality was similar in both systems.

*Figure 11: Kikuyu Stem & Stolon Dissection*

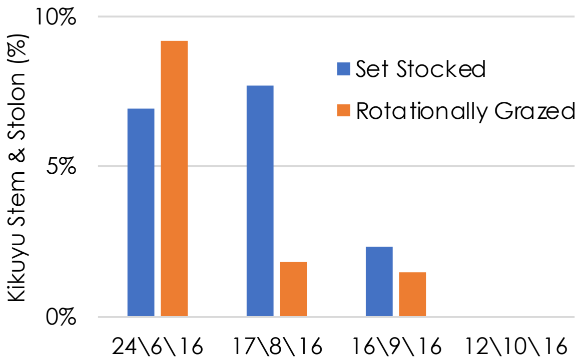
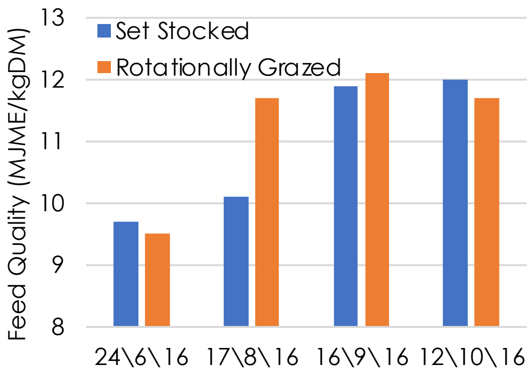



*Figure 12: Feed Quality (MJME/kgDM)*




**Pugging:** The set stocked system had more pugging damage in both the August and September assessment.

*Table 9: Visual Pugging (% of 30 samples)*

| | **17/8/16** | **16/09/16** |
|---|---|---|
| Set Stocked | 70% | 71% |
| Rotationally Grazed | 48% | 47% |

**Animal Production:** Average liveweight is outlined in Figure 13 and Table 10. Over 141 days of the demonstration, the rotationally grazed bulls grew 0.35 kgLWG per day faster than the set-stocked bulls. This represents a 60% increase in liveweight gain in the rotationally grazed bulls compared to the set-stocked bulls.

*Table 10: Animal Production Comparison (liveweight)*

| | **Demonstration 141 days (Jun – Nov)** | | | |
|---|---|---|---|---|
| | **Start (kgLW/head)** | **Finish (kgLW/head)** | **Production (Liveweight Gain - kgLWG)** | |
| | 19/6/16 | 7/11/16 | kgLWG/head | kgLWG/ha |
| Set Stocked (Avg) | 183 | 275 | 92 | 405 |
| Rotationally Grazed (Avg) | 174 | 315 | 141 | 650 |

Table 11 outlines the potential financial impact assuming the bulls were sold at the end of the demonstration (in November) using both the 2016 market price and the long term price (based on long term price trends equivalent to $5/kgCW). In both pricing scenarios, the rotationally grazed system would be expected to generate ~$700/ha more revenue or between 65% (long term prices) – 100% (2016 price) more margin per hectare than the set stocked system.

*Table 11: Indicative Margin ($) using 2016 and long-term pricing*

| | 2016 Prices | | | | Long Term Prices ($5/kgCW) | | | |
|---|---|---|---|---|---|---|---|---|
| | Start $/ hd | Finish $/ hd | Revenue | | Start $/ hd | Finish $/ hd | Revenue | |
| | | | $/head | $/ha | | | $/head | $/ha |
| Set Stock | 659 | 825 | 166 | 731 | 534 | 773 | 238 | 1049 |
| Rotation | 626 | 945 | 319 | 1469 | 508 | 885 | 377 | 1738 |
| Difference | -32 | 120 | 152 | 737 | -26 | 112 | 139 | 689 +66% |

[1] 2016 Prices: Bulls valued at $3.60/kgLW at start (19/6/16) and $3.00.kgLW at the end (7/11/16)
[2] Long Term Prices ($5/kgCW): Bulls valued at $2.92/kgLW in June and $2.81/kgLW in Nov

**Discussion:** This demonstration confirmed that rotational grazing contributes to better pasture growth than set stocking and this benefit can be captured as better animal production and revenue per hectare. This demonstration clearly shows how the principles of grazing management can be applied to increase production and revenue.

During the demonstration pasture cover was consistently higher on the rotationally grazed system, contributing to better feed allowance and liveweight gain. The regular shifting and back-fencing in the rotationally grazed system prevented over-grazing and protected regrowth, key drivers of pasture growth. These results suggest that rotational grazing can support a higher stocking rate, while still achieving good animal performance. For the set stocked system to be sustainable, the stocking rate would need to be reduced relative to a rotationally grazed system.

Pasture quality differences also demonstrated the benefits of rotational grazing. Set stocked bulls preferentially grazed better quality pasture first, while the rotationally grazed bulls grazed uniformly. By August, the rotationally grazed bulls were consuming high quality pasture (11.7 MJME/kgDM), while the set stocked system were left with poorer quality pasture from previous grazings (10.1 MJME/kgDM). By September pasture quality was similar between the systems and pasture allowance (quantity) had become the limiting factor on the set stocked system.

The difference in pugging between the two systems reflects feedback from farmers – "hungry animals walk and when it's wet, that walking becomes pugging". This could also be related to the grazing interval – a slow winter rotation means there are fewer grazing events and less opportunity for pugging. Another factor could be the area available to move each day – the set stocked bulls had 5 ha to graze each day, while the rotationally grazed bulls had 0.3 ha to graze.

Sediment loss is a significant factor in water quality, rotationally grazing has the dual benefit of reducing overall pugging, but also, higher pasture cover helps trap sediment, preventing contamination of water-ways.

Animal production and revenue differences in this demonstration underline the value of good grazing management. This demonstration achieved the goal of the group – increasing pasture eaten by >1,000 kgDM/ha and revenue by >$300/ha. The revenue difference in this demonstration was substantial; given the set-up costs for extra fencing and water reticulation in a rotational grazing system can be $700/ha ($500-$1200), there's potential to recover infrastructure costs within a year.

# Demonstration 4: Annual Ryegrass Established into Existing Pasture (R2 Bulls)

**Location & Year:** Jun 2017 – Jan 2018. James Donaldson's Farm, Portland, Whangarei

**Summary:** Introducing annual ryegrass into existing pasture:

- After deducting costs of $200/ha there was a loss of ~$55/ha
- Increased pasture eaten by 0.3 tDM/ha more pasture (5%)
- Increased liveweight gain per hectare by 10% (53 kgLWG/ha)
- Generated additional revenue of $145/ha (15% more)

*Bulls grazing annual ryegrass*

*Annual ryegrass demonstration*

**Goal:** Compare performance of annual ryegrass (established into existing pasture) against existing pasture without annual ryegrass (control) with a focus on pasture and animal production and profitability.

**Background:** Annual ryegrass has widespread use on dairy farms (mulched and/or drilled into existing kikuyu pasture). Annual Ryegrass has good winter and spring pasture growth, complementing the pasture growth curve of kikuyu, making it an ideal companion species. This demonstration compares the performance of pasture with annual ryegrass (drilled into existing kikuyu pasture) against that of existing kikuyu without introduced annual ryegrass. The hypothesis is the introduction of annual ryegrass into existing pasture will increase pasture growth and animal performance compared with existing pasture (control) producing a profitable response.

**Method:** Two adjacent bull systems of 8ha were selected for the demonstration. One system was drilled with Bullet Annual Ryegrass (20 kg/ha) in late March, the control system was not drilled (neither area was mulched). In June the systems were stocked with R2 bulls as outlined in Table 12. Apart from the Annual Ryegrass, the systems received the same management. The systems started on a 60-day rotation in June, moving to a 30-day rotation on 1st September until the bulls were finished in January 2018. Establishment costs for the annual ryegrass totalled $200/ha ($80/ha for the seed and $120/ha for drilling the annual ryegrass seed).

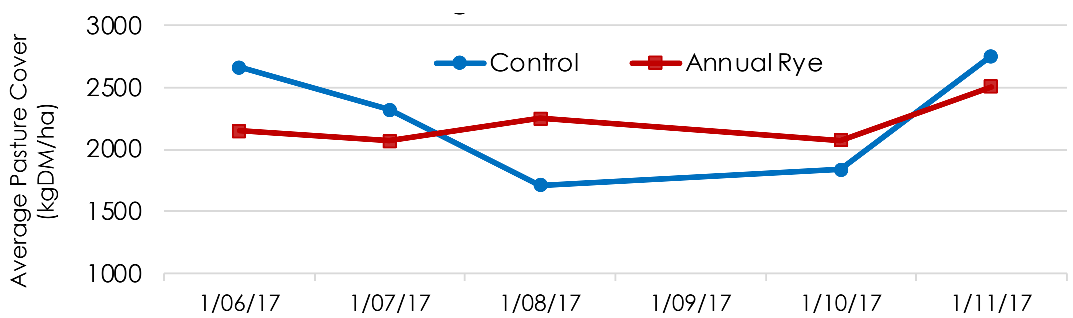
*Table 12: Overview of the Demonstration*

| | Annual Ryegrass | Control |
|---|---|---|
| Area | 8ha | 8ha |
| R2 Bulls (Mob size) | 20 | 20 |
| Bulls/ha | 2.5 | 2.5 |
| Avg LW (18/6/17) (kgLW/head) | 381 | 388 |
| Starting Liveweight (kgLW/ha) | 952 | 970 |

Pasture cover was assessed visually. Pre-graze pasture samples were assessed for species and composition (dissection) and feed quality (lab analysis).

**Average Pasture Cover:** There was an advantage in pasture cover to the annual ryegrass treatment through late winter and spring (Figure 13). Farmax analysis also indicates a small increase in pasture eaten; The annual ryegrass treatment harvested 5.42 tDM/ha compared to the control system at 5.16 tDM/ha, representing a 5% increase over the control system.

*Figure 13: Average Pasture Cover*



**Pasture Species & Feed Quality:** There was a substantial difference in pasture species between the systems (Figure 14), which contributed to slight differences in feed quality (Figure 15) with the annual ryegrass treatment having higher energy. Annual ryegrass was relatively slow to emerge, increasing in the three samples to be most dominant in October:

*Figure 14: Annual Ryegrass (% Pasture)*

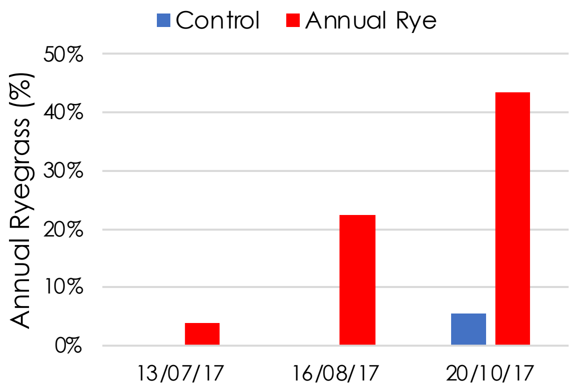
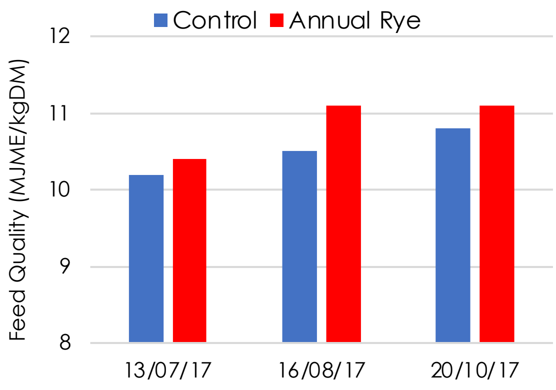



*Figure 15: Feed Quality (MJME/kgDM)*




**Animal Production:** Animal production is outlined in Table 13. Over 207 days of the demonstration, individual growth rates were slightly higher in the annual ryegrass system (1.1 kgLWG/day vs 1.0 kgLWG/day for the control). This equated to an advantage of ~53 kgLWG/ha (26 kgCWG/ha) for the annual ryegrass system, an increase of 10% above the control. Liveweight gain is estimated (based on a 50% dressing percentage).

*Table 13: Animal Production Comparison (liveweight equivalent)*

| | | | **kgLW/head** | **kgCW/head** | **Liveweight Gain[1]** | |
|---|---|---|---|---|---|---|
| | ha | Mob | 18-Jun-17 | 11-Jan-18 | kgLWG/head | kgLWG/ha |
| Control | 8 | 20 | 388 | 296 | 204 | 510 |
| Annual | 8 | 20 | 381 | 303 | 225 | 563 |
| Difference vs Control | | | -7 | 7 | 21 (+10%) | 53 (+10%) |

*[1] Assuming a 50% dressing percentage*

**Revenue:** Revenue is outlined in Table 14. This indicates the annual ryegrass treatment generated additional revenue of $145/ha (15% more) compared to the control system. Deducting establishment costs of $200, this leaves a loss of around $55/ha compared to the Control system revenue (6% less).

*Table 14: Indicative Revenue Comparison*

| | | | | **Value ($)** | **Margin** | |
|---|---|---|---|---|---|---|
| | ha | Mob | 18-Jun[1] | 11-Jan[2] | $/head | $/ha |
| Control | 8 | 20 | $1,164 | $1,557 | $393 | $983 |
| Annual Rye | 8 | 20 | $1,143 | $1,593 | $451 | $1,128 |
| Difference vs Control | | | -$21 | $37 | $58 (+15%) | $145 (+15%) |

*[1] Based on a purchase price of $3/kgLW*
*2 Based on actual revenue of $5.26/kgCW*

**Discussion:** The demonstration confirms the hypothesis that annual ryegrass is an effective option to increase winter and spring pasture growth and increase animal performance and revenue. This increase in revenue was slightly less than the cost of establishing the annual ryegrass.  A slight reduction in establishment costs (e.g. if the farmer owned their own drill rather than using a contractor) may achieve a break-even response.

Introducing annual ryegrass into existing kikuyu dominant pasture (via mulching and/or drilling) is a common management practice among Northland dairy farmers.  Dairy farmers tend to have higher income and expenses on a per hectare basis when compared to beef farmers (e.g. Dairy farmers typically spend ~$3000/ha to operate their business compared with beef farmers at $700/ha).  Introducing annual ryegrass on a beef farm and increasing costs by $200/ha represents a ~28% increase in costs, while on a dairy farm that expenditure equates to just a 7% increase.

Beef farms tend to operate on slimmer margins; there needs to be a compelling cost:benefit response to ensure the new technology is profitable.  Establishment of annual ryegrass would be a recurring, annual cost for a beef farm.  This demonstration suggests annual ryegrass has potential to increase pasture growth and liveweight gain, but there's no guarantee this would generate additional profit and it may be best suited to those farmers who have already optimized grazing management and are looking at fine tuning their production systems.

## Demonstration 5: Annual Ryegrass into Sprayed Out Pasture

**Location & Year:** May – Nov 2017, Pukekaroro, Te Kau, Far North

**Summary:** Relative to existing pasture, the annual ryegrass system:

- After deducting costs of $290/ha the effective return was $57/ha or 8% better than existing pasture
- Harvested 1.7tDM/ha more pasture (61%)
- Had 52% more Liveweight gain per hectare
- Generated additional revenue of $347/ha (49% more)

**Goal:** Compare performance of annual ryegrass (established into sprayed out pasture) against existing pasture (control) with a focus on pasture and animal production and profitability.

**Background:** Annual ryegrass has a complementary pasture growth curve to that of kikuyu pasture. This demonstration compares the performance of annual ryegrass against that of existing kikuyu dominant pasture. The hypothesis is that annual ryegrass will grow more pasture and increase animal performance compared with existing pasture (control) producing a profitable response.

**Method:** Sultan annual ryegrass was drilled into 11ha of sprayed out pasture (sprayed with glyphosate in March). DAP (100 kg/ha) and slugbait was applied at sowing. The control area was a 17ha block with existing kikuyu dominant pasture (no DAP or slugbait was applied). Costs of establishing annual ryegrass are outlined in Table 15:

*Table 15: Establishment Costs for Annual Ryegrass System (2017 prices)*

| | Cost ($/ha) |
|---|---|
| Spraying Out | $20 |
| Sultan Seed (16 kg/ha) | $80 |
| Drilling | $95 |
| DAP @ 100 kg/ha | $70 |
| Slugbait | $10 |
| Weed-spray & Insecticide | $15 |
| **Total** | **$290** |

In mid-May a separate mob of Dairy heifers were allocated to each block as outlined in Table 16. The Annual ryegrass was expected to have superior winter growth and was stocked at a higher rate. Subsequent management of each block was the same (rotation length, nitrogen, etc). The demonstration concluded on the 7th November.

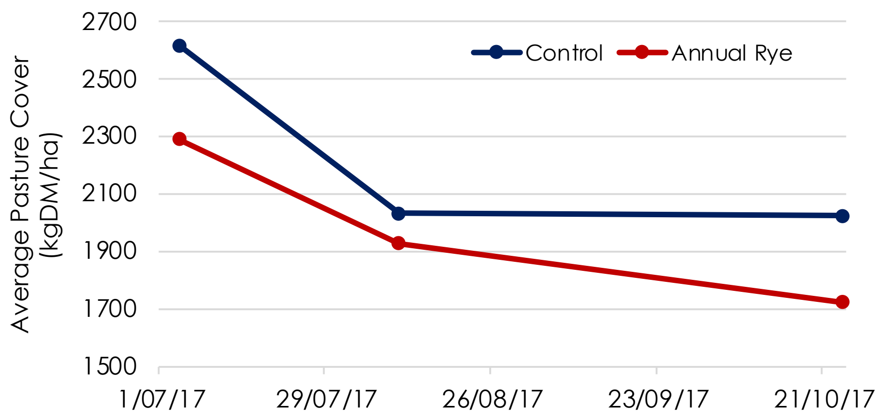
*Table 16: Overview of the Demonstration*

| | Annual Ryegrass | Control |
|---|---|---|
| Area | 11 ha | 17 ha |
| Heifers (Friesian X) | 50 | 50 |
| Avg LW (23/5/17) | 216 kg/head | 205 kg/head |
| Heifers/ha | 4.5 | 2.9 |
| Starting Liveweight (kgLW/ha) | 972 | 595 |

Pasture cover was assessed visually. Pre-graze pasture samples were assessed for species and composition (dissection) and feed quality (lab analysis).

Average Pasture Cover: There was a slight advantage to the control system in average pasture cover through the winter and spring (Figure 16). Farmax analysis indicates a substantial difference in pasture eaten; The annual ryegrass treatment (with a higher stocking rate) harvested 4.5 tDM/ha compared to the control system at 2.8 tDM/ha, which represents a 61% increase over the control system.

*Figure 16: Average Pasture Cover*




**Pasture Species & Feed Quality:** There was a substantial difference in pasture species between the systems (Figures 17 & 18):

*Figure 17: Kikuyu Presence (% Pasture)*

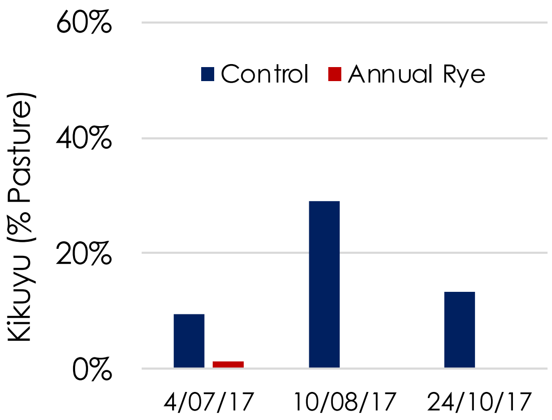
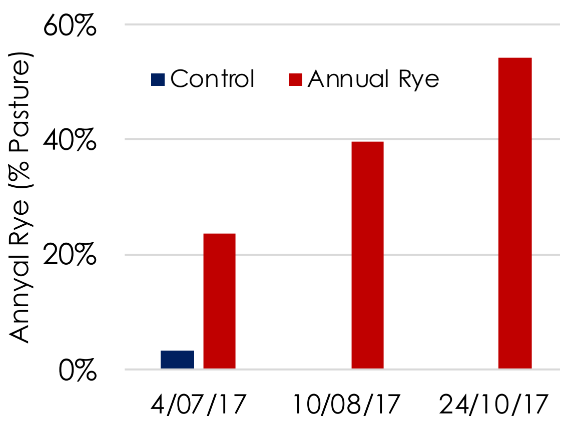
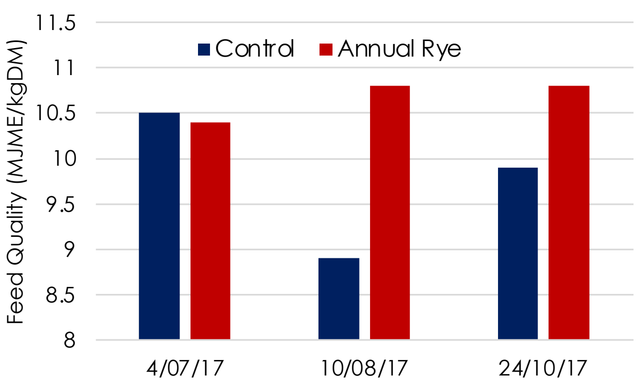



*Figure 18: Annual Ryegrass (% Pasture)*




Feed quality was higher in the annual ryegrass system from late winter (Fig 19):

*Figure 19: Kikuyu Presence (% Pasture)*



**Animal Production:** Animal production is outlined in Table 17. Over 168 days of the demonstration, individual heifer growth rates were similar (0.53 kgLWG/day for the annual ryegrass compared to 0.54 kgLWG/day for the control heifers). The stocking rate difference resulted in the annual ryegrass system producing an extra 139 kgLW/ha or 52% more compared to the control system.

*Table 17: Animal Production Comparison (liveweight)*

| | | | | Liveweight per head | | Liveweight Gain | |
|---|---|---|---|---|---|---|---|
| | **ha** | **Mob** | **Heifers/ha** | **23-May** | **7-Nov** | **kg/head** | **kg/ha** |
| Control | 17 | 50 | 2.9 | 205 | 296 | 91 | 266 |
| Annual | 11 | 50 | 4.5 | 216 | 305 | 89 | 405 |
| Difference vs Control | | | 1.6 (+55%) | 11 | 9 | -2 (-2%) | 139 (+52%) |

**Revenue:** Potential revenue difference, assuming the heifers were sold at the end of the demonstration (in November) is outlined in Table 18. This indicates the annual ryegrass treatment generated an additional $347/ha (49% more) than the control system. Deducting establishment costs of $290, this leaves around $57/ha surplus compared to the Control system revenue (8% more).

*Table 18: Indicative Revenue Comparison*

| | | | | Value ($) | | Revenue | |
|---|---|---|---|---|---|---|---|
| | **ha** | **Mob** | **Heifers/ha** | **23-May** | **7-Nov** | **$/head** | **$/ha** |
| Control | 11 | 50 | 4.5 | $756 | $991 | $235 | $1,058 |
| Annual | 17 | 50 | 2.9 | $717 | $962 | $245 | $711 |
| Difference vs Control | | | 1.6 | $39 | $29 | -$10 (-4%) | $347 (+49%) |

**Discussion:** The demonstration confirms the hypothesis that annual ryegrass is an effective option to increase winter and spring pasture growth. If stocking rate is increased to utilize the extra pasture, this should translate to better animal performance (on a per hectare basis).

Despite a substantial increase in pasture growth and liveweight gain, after deducting establishment costs associated with annual ryegrass, the financial advantage to the annual ryegrass treatment reduced to around 8% more than the control system. This does not take into account the cost of establishing permanent pasture or a crop, which would be required once annual ryegrass growth declines in summer and autumn.

Annual ryegrass may be a useful option to control kikuyu in a wet autumn when kikuyu growth is strong, especially if it is being used as part of a cropping or permanent pasture program.

## Demonstration 6: R1 Bull Stocking Rate Comparison (low, medium, high)

**Location & Year:** May - Nov 2017 & 2018, Dennis & Rachelle O'Callaghan, Temataa Station, Doubtless Bay


**Summary:** The Low Stocking Rate was associated with:

- Higher average pasture cover through winter and spring
- Similar pasture quality through spring
- Only slightly less pugging damage than the Medium and High SR
- 15-17% more liveweight gain per head than the High SR treatment
- 5-6% less overall production per hectare than the High SR treatment
- Similar revenue per hectare if animals were valued at the same $/kgLW
- 7-12% less revenue where smaller animals are animals at valued at a premium (10c/kgLW)


*R1 Bulls on 10 lane Techno*

*10 lane Techno - Spring*

*R1 Bulls SR Comparison*

**Goal:** Demonstrate the impact of stocking rate on pasture and animal production, profitability and pugging.

**Background:** Stocking rate is an important driver of pasture system performance; a low stocking rate may compromise pasture quality, while a high stocking rate can suppress pasture growth through low pasture cover and pugging. This demonstration aimed to quantify the impact of varying starting stocking rate on winter and spring pasture and animal production, margin and pugging damage.

The hypothesis was that a lower stocking rate would have higher pasture growth from less pugging and higher winter pasture covers, but the lower "eating power" would contribute to poorer pasture quality in spring, impacting on liveweight gain.

**Method:** A 10 lane techno-grazing system was used for the demonstration in both years. Lanes 1-9 were assigned to either Low, Medium or High stocking rate treatments (alternating lanes) with 3 replicates of each stocking rate treatment (i.e. total of 261 bulls allocated per year). Each lane had an area of 6.4 ha and stocking rate was based on the number of yearling Friesian bulls in each lane as outlined in Table 19.

*Table 19: Stocking Overview (starting liveweight) - average of 3 Replicates*

| Treatment | Mob size | Bulls/ha | Stocking Rate | | Liveweight Gain | |
|---|---|---|---|---|---|---|
| | | | kgLW/head | kgLW/ha | kgLW/head | kgLW/ha |
| Low SR | 26 | 4 | 147 | 594 | 187 | 760 |
| Medium SR | 29 | 4.5 | 147 | 663 | 190 | 862 |
| High SR | 32 | 5 | 148 | 735 | 186 | 930 |

The demonstration was run in 2017 and again in 2018, with lanes reallocated between years. The demonstration started when the bulls were shifted to the system and allocated into different mobs (23rd May in 2017 and 3rd May in 2018). The demonstration concluded when the bulls were sold (30th November 2017 and 17th January 2019). 2017 was characterised as a wet winter, compared to a drier winter in 2018. Bull liveweights in May were heavier in 2018, resulting in the starting liveweight per hectare being ~26% more than 2017.

Rotation length and management was the same for all lanes once the demonstration started; a 60-day rotation through winter, speeding up to 45 days in August, then 30 days in September. Nitrogen was applied equally to all treatments in both years.

Pasture cover was assessed visually, pasture quality was assessed using lab analysis and species dissection of pre-graze samples. Pugging presence was assessed based on measurement at 50 points per system. Liveweight was assessed at the start and the end of the demonstration. The data presented represents the average of the replicates for each treatment.

**Average Pasture Cover:** There was a marked difference in pasture cover between years – in 2017 (Fig. 20) pasture cover was lower generally than in 2018 (Fig. 21) with a larger difference between treatments. The Low stocking rate treatment had higher pasture cover in both years, typically around 150-200 kgDM/ha above the High stock treatment (8-20% higher pasture cover). In 2017 the High stock treatment had lower pasture cover than the Medium Stocked treatment, but pasture cover was similar between these treatments in 2018. The low pasture cover in 2017 is expected to have restricted intakes for both the Medium and High stocking rate treatments.

*Figure 20: Average Pasture Cover (2017 – Wet Winter)*

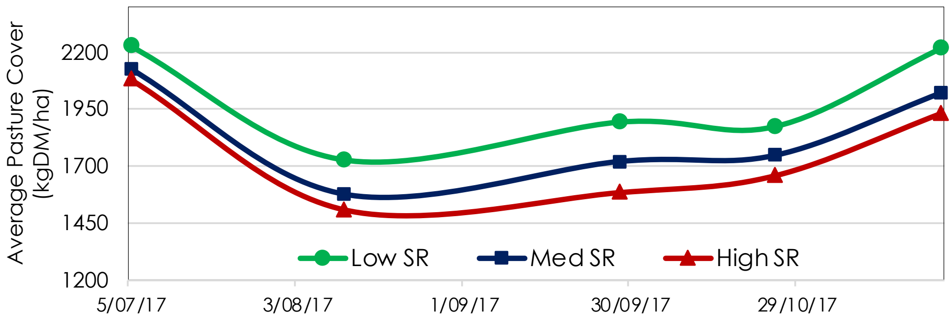
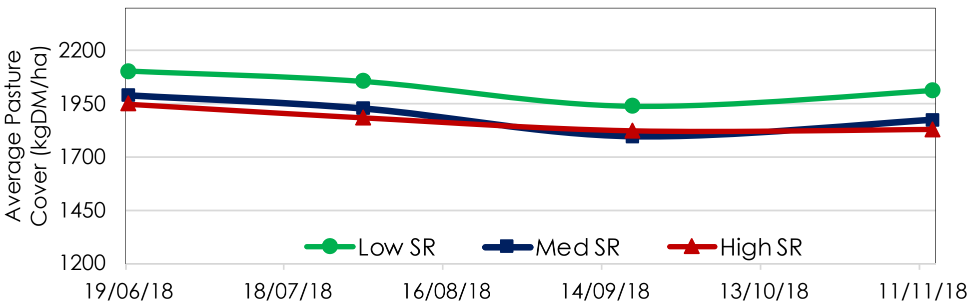



*Figure 21: Average Pasture Cover (2018 – Drier Winter)*




**Pugging:** Pugging was assessed (presence of pugging as a percentage of 50 points) and is summarized in Table 20. Pugging was more prevalent in the wetter year (2017). Overall pugging was similar between treatments; there was a trend to slightly more pugging in the High SR treatment, however the difference between years was much greater than the difference between treatments.

*Table 20: Pugging Presence (% of 50 points)*

| | **Low SR** | **Medium SR** | **High SR** |
|---|---|---|---|
| **R1 Bulls/ha** | **4** | **4.5** | **5** |
| Pugging % 2017 (Wet Winter) | 69% | 71% | 74% |
| Pugging % 2018 (Drier Winter) | 38% | 44% | 44% |

**Pasture Quality:** Pasture quality showed similar trends between years as outlined in Figure 22 (2017) and Figure 23 (2018); the High Stocking Rate treatment had better pasture quality through winter, but overall pasture quality was similar through spring. There were no substantial or consistent differences in pasture species between treatments.

*Figure 22: Pasture Quality (MJME) 2017*

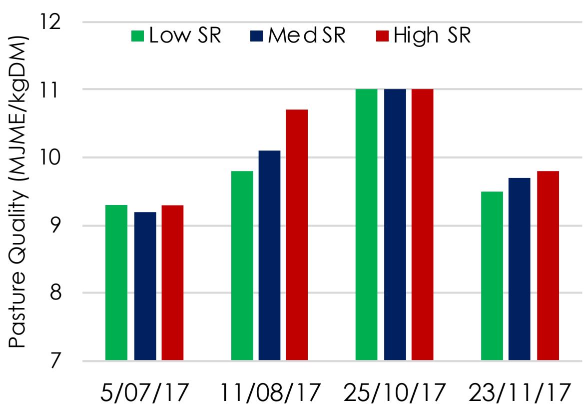
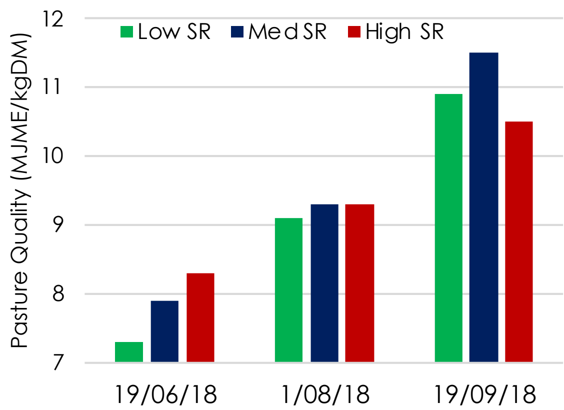



*Figure 23: Pasture Quality (MJME) 2018*




**Pasture Eaten:** The quantity of pasture eaten was estimated using Farmax for each treatment and is outlined in Table 21. The High Stocking Rate treatment consumed the greatest amount of pasture in both years, representing an increase of 10-12% over than the Low SR treatment.

*Table 21: Pasture Eaten (kgDM/ha) for each treatment (2017 and 2018)*

| | 2017 (191 days) | 2018 (259 days) |
|---|---|---|
| Low SR | 5,340 | 6,210 |
| Medium SR | 5,580 | 6,820 |
| High SR | 5,900 | 6,980 |

**Animal Production:** Liveweight data is outlined for the two years in Table 22 (2017) and Table 23 (2018) – this represents the average of the replicates (three replicates per treatment per year).

*Table 22: Start and Finish Liveweight for each treatment: 2017 results*

| 2017 | Bulls/ha | Per Head (kgLW/head) | | | Per Hectare (kgLW/ha) | | |
|---|---|---|---|---|---|---|---|
| | | Start 23/05/17 | Finish 30/11/17 | Gain kgLWG/hd | Start 23/05/17 | Finish 30/11/17 | Gain kgLWG/ha |
| Low | 4 | 147 | 339 | 192 | 594 | 1371 | 777 |
| Medium | 4.5 | 147 | 321 | 174 | 663 | 1448 | 785 |
| High | 5 | 148 | 312 | 164 | 735 | 1553 | 818 |

*Table 23: Start and Finish Liveweight for each treatment: 2018 results*

| 2018 | Bulls/ha | Per Head (kgLW/head) | | | Per Hectare (kgLW/ha) | | |
|---|---|---|---|---|---|---|---|
| | | Start 3/05/18 | Finish 17/01/19 | Gain kgLWG/hd | Start 3/05/18 | Finish 17/01/19 | Gain kgLWG/ha |
| Low | 4 | 187 | 322 | 135 | 760 | 1308 | 548 |
| Medium | 4.5 | 190 | 317 | 127 | 862 | 1438 | 576 |
| High | 5 | 186 | 303 | 117 | 930 | 1513 | 583 |

Liveweight gains were greater in 2017, with average daily gain almost twice that of 2018 (0.92 kgLWG/head/day in 2017 vs 0.49 kgLWG/head/day in 2018). In 2018 bulls were carried into January before being sold.

Individual liveweight gains (per head) were greatest for bulls on the Low SR treatment in both years; gaining 15-17% more than the High SR bulls and 6-9% more than the Medium SR bulls across the 2 years. This reinforces differences from the pasture cover analysis and suggests the intakes in the High and Medium SR treatments were restricted relative to the Low SR treatment.

Overall production (liveweight gain per hectare) was greatest in the High SR treatments in both years, averaging 5-6% more than the Low SR treatment. In 2017 the High SR treatment grew 4% more than the Medium SR treatment, but this advantage reduced to only 1% in 2018.

**Financial Analysis:** The financial comparison is outlined in Table 24 for both years, using estimated purchase and sale prices of those years. 2017 generated higher margins than 2018 (associated with greater liveweight gain). The margin per head was highest in the Low SR treatment (21-24% higher than the High SR treatment), however this is offset by the lower stocking rate and overall margins per hectare were similar between treatments in both years when using the same sale price ($/kgLW)for all treatments.

*Table 24: Estimated Purchase, Sale and Margins for each treatment – Flat Prices*

| | 2017[1] | | | | 2018[2] | | | |
|---|---|---|---|---|---|---|---|---|
| | **Start** | **Finish** | **Margin** | | **Start** | **Finish** | **Margin** | |
| | $/hd | $/hd | $/hd | $/ha | $/hd | $/hd | $/hd | $/ha |
| Low SR | $581 | $1,034 | $453 | $1,842 | $655 | $966 | $312 | $1,265 |
| Med SR | $581 | $979 | $398 | $1,805 | $665 | $951 | $286 | $1,296 |
| High SR | $585 | $952 | $367 | $1,835 | $651 | $909 | $258 | $1,290 |

*[1] 2017: Based on purchase price of $3.95/kgLW and sale price of $3.05/kgLW*
*[2] 2018: Based on purchase price of $3.50/kgLW and sale price of $3.00/kgLW*

In Table 24 a flat sale price was used for all treatments ($/kgLW), but it's possible the lighter bulls in the Medium SR and High SR treatments would have generated a premium of $0.05 - $0.10/kgLW over the heavier Low SR bulls. Table 25 outlines the impact of applying a sales premium of $0.05/kgLW for the Medium SR treatment and $0.10/kgLW for the High SR treatment. This change to variable sales pricing makes the High SR more profitable by 7-12% over the Low SR treatment.

*Table 25: Estimated Sale, Purchase and Margins for each treatment – Variable Prices*

| | 2017[1] | | | | 2018[2] | | | |
|---|---|---|---|---|---|---|---|---|
| | **Start** | **Finish** | **Margin** | | **Start** | **Finish** | **Margin** | |
| | $/hd | $/hd | $/hd | $/ha | $/hd | $/hd | $/hd | $/ha |
| Low SR | $581 | $1,017 | $436 | $1,773 | $655 | $950 | $295 | $1,200 |
| Med SR | $581 | $979 | $398 | $1,805 (+2%) | $665 | $951 | $286 | $1,296 (+8%) |
| High SR | $585 | $967 | $383 | $1,913 (+8%) | $651 | $924 | $273 | $1,366 (+14%) |

*[1] 2017: Based on purchase price of $3.95/kgLW and sale prices of $3/kgLW Low SR, 3.05/kgLW for Medium SR and $3.10/kgLW for High SR treatments*
*[2] 2018: Based on purchase price of $3.50/kgLW and sale prices of $2.95/kgLW Low SR, 3.00/kgLW for Medium SR and $3.05/kgLW for High SR treatments*

**Discussion:** The hypothesis was the Low SR treatment would grow more pasture (less pugging damage and higher pasture covers) but that this extra pasture growth would contribute to poor pasture quality and lower liveweight gain in spring. In this demonstration there was little difference in pugging and while the Low SR treatment maintained higher pasture cover, there was little evidence of reduced pasture quality having an impact on liveweight gain. This suggests there's a relatively broad range in stocking rate before production per hectare and profitability is impacted.

Stocking rate is a key component of beef farming management; some industry professionals believe that higher stocking rates are associated with greater profitability. This demonstration suggests profitability may be less sensitive to stocking rate than initially anticipated, at least within the range that was tested in this case.

Starting stocking rate (kgLW/ha) varied by 20-27% between the Low SR and High SR treatments on a kgLW/ha basis (27% in 2017 and 20% in 2018). This may not have been sufficient variation to highlight differences between stocking rate. Northland typically experiences less of a "spring flush" in pasture growth than other regions, which may have been a factor in the Low SR treatment maintaining pasture quality through spring. Regions with a greater difference between winter and spring growth may experience greater difference between treatments.

There was little difference in pugging damage – the soils in this demonstration were podzolised (gumland soils); pugging can be an issue through winter and spring. Pugging was widespread across all treatments in 2017 (wetter winter) and while there was less pugging in the drier 2018 winter, any difference between treatments were relatively small. It's unlikely this relatively small difference in pugging resulted in pasture growth differences between the stocking rate treatments.

Low SR treatments were associated with higher individual liveweight gain in both years – this has implications for farmers considering the end market for their stock – e.g. lower stocking rates may advantageous when finishing animals before their second winter or to reach a minimum target liveweight by a set date.

Overall production per hectare was slightly more in the High SR treatments in both years (5-6% more than the Low SR treatment and 1-4% more than the Medium SR treatment). Table 6 (using a flat sale price per kgLW) indicates little difference in revenue between the treatments. There's likely to be higher costs associated with the High SR treatment (more animal health, opportunity cost on purchase price, etc), but these would generally be minor.

If a premium is applied for lighter stock (Table 25), the High SR treatment becomes more profitable (7-12% more revenue than the Low SR treatment, or $140-$166/ha – enough to offset any extra costs from the higher stocking rate). There needs to be caution with relying on this approach – those lighter animals could become less attractive to a purchaser below a certain weight - the premium could easily become a penalty below a certain live-weight.

## Demonstration 7: Stocking Rate Comparison (R2 Bull Size)

**Location & Year:** Apr – Dec 2018, Landcorp Rangiputa, Rangiputa, Far North

**Summary:** Compared to the medium and large bulls, smaller bulls:

- Harvested 6-10% more pasture
- Had higher liveweight gain per hectare (4-31%)
- Had the greatest production gain (14% more)
- Generated slightly more revenue per hectare (5-9%)


*R2 Bulls - Rangiputa*

**Goal:** Compare performance of different sized bulls with the same starting stocking rate (liveweight per hectare, but variable bulls/ha) with a focus on pasture and animal production, pugging and soil disturbance and profitability.

**Background:** Winter stocking rate (measured as liveweight per hectare) is a key performance indicator among many farmers, but how important is mob size, stocking rate (bulls/ha) and the size of the bulls to setting this starting liveweight per hectare? Heavier cattle are associated with more pugging damage and with lower stock numbers per hectare, will there be enough eating power to control spring pasture growth? The hypothesis is that smaller cattle will have less pugging damage and better pasture utilisation, which will translate into better animal production and productivity per hectare.

**Method:** A 60 ha, 12-lane techno-grazing system on free-draining sandy/peat soils at Landcorp Rangiputa was the site for this demonstration. 145, R2 Friesian bulls (20 month) were drafted into three treatments based liveweight; Light bulls (avg 373 kgLW/head), Medium bulls (avg 432 kg/head; 16% heavier than the Light bulls) and Heavy bulls (avg 463 kgLW/head or 24% heavier than the Light bulls), with four replicates (lanes) of each treatment. The treatment averages are outlined in Table 26. Groups were alternated across the 12 lanes and each lane was grazed as a separate mob in their own 5 ha block from April to December. Bulls were finished in mid-December. All lanes received the same management once the system was started (rotation length, nitrogen, etc). The bulls started on a 90-day rotation, speeding up to 45 days in August and 30 days in September.

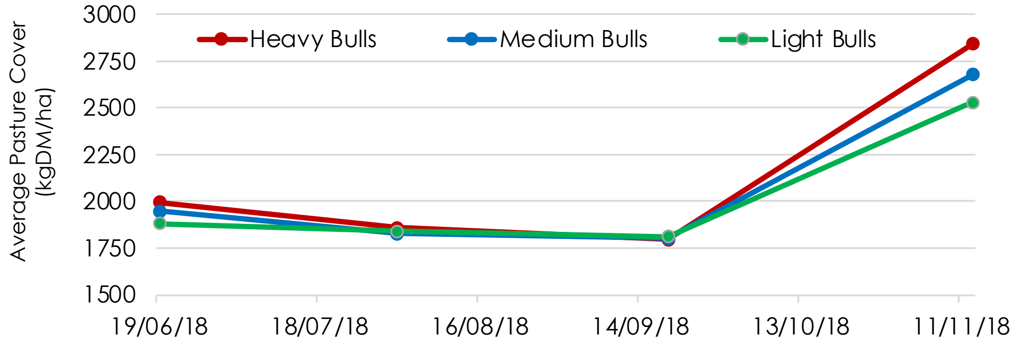
Pasture cover was assessed visually. Pugging presence was assessed based on 50 points per lane in September. The presence of bulls digging was assessed for each lane. Data presented is the average of the four replicates for each treatment.

*Table 26: Overview of the Demonstration (12/4/20)*

| | Light Bulls | Medium Bulls | Heavy Bulls |
|---|---|---|---|
| Mob Size (Range) | 13-14 | 11-12 | 11 |
| Average Mob Size (of 4 replicates) | 13.5 | 11.8 | 11 |
| Average Stocking Rate (Bulls/ha) | 2.7 | 2.4 | 2.2 |
| Avg Liveweight (kgLW/Head) | 373 | 432 | 463 |
| Avg Liveweight (kgLW/ha) | 1006 | 1013 | 1018 |

**Average Pasture Cover:** Pasture cover was similar across the treatments through most of the winter and spring, but pasture cover increased in November for the Medium and Heavy bulls (Figure 24).

*Figure 24: Average Pasture Cover (average of 4 replicates)*



Farmax analysis indicates the Light bulls harvested the most pasture (10% more than the Heavy bulls and 6% more than the Medium bulls (Table 27).

*Table 27: Total Feed Eaten (tDM/ha) during the Demonstration (Apr-Dec)*

| | Light | Medium | Heavy |
|---|---|---|---|
| Pasture Eaten (tDM/ha) | 6.82 | 6.42 | 6.19 |

**Pugging:** There was a trend of less pugging damage and fewer bull holes in the Lighter bull treatments (Table 28). These soils were relatively free draining and the amount of pugging damage was low in comparison with other farms (with clay soils).

*Table 28: Pugging (Presence at 50 sites per lane) and Bull Holes (holes per lane)*

| | Light | Medium | Heavy |
|---|---|---|---|
| Pugging (% of sites) | 19% | 25% | 29% |
| Bull Holes (per lane) | 10 | 13 | 14 |

**Animal Production:** Animal production is outlined in Figure 25 (liveweight/head) and Tables 29 (liveweight) and 30 (carcass weight). Individual liveweight gain per head was similar, although the Light bulls treatment had slightly higher growth per head (7-8% more). Overall liveweight gain per hectare (from April to November) was greatest in the Light bulls (31% more than the Heavy bulls).

The dressing percentages of the Heavy and Medium bulls carcass were greater than the Light bulls. This higher dressing percentage reduced the production per hectare advantage from the smaller bulls to 14% over both the Medium and Heavy bulls.

*Figure 25: Average Bull Liveweight (kgLW/head)*

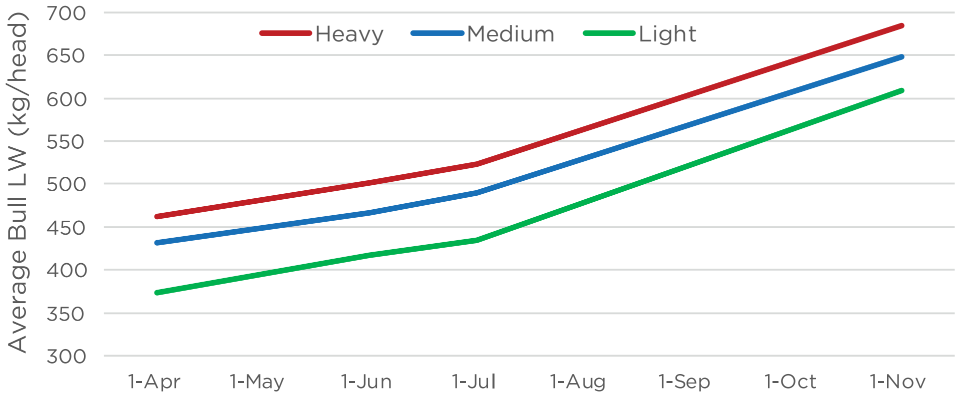



*Table 29: Liveweight Data (Apr-Nov)*

| | Bulls/ha | kgLW/head | | Liveweight Gain (kg) | | |
|---|---|---|---|---|---|---|
| | | 6-Apr | 16-Nov | LWG/hd | LWG/ha | LWG/hd/day |
| Light | 2.7 | 373 | 609 | 236 | 638 | 1.06 |
| Medium | 2.4 | 432 | 648 | 217 | 509 | 0.97 |
| Heavy | 2.2 | 463 | 684 | 221 | 487 | 0.99 |

*Table 30: Production (kg Carcass Weight Gain)*

| | Bulls/ha | kgLW/head | Carcass Weight (12-Dec) | | |
|---|---|---|---|---|---|
| | | 6-Apr | kgCW/hd | CWG/ha[1] | Dressing %[2] |
| Light | 2.7 | 373 | 311 | 337 | 53% |
| Medium | 2.4 | 432 | 341 | 295 | 54% |
| Heavy | 2.2 | 463 | 365 | 294 | 55% |

*[1] Carcass Weight Gain (kgCWG) assuming starting weight at 50% Dressing*
*[2] Dressing out percentage based on Carcass weight as % of Liveweight at the processor*

**Revenue:** The revenue comparison is outlined in Table 31. The purchase price ($/kgLW) has been discounted for the Heavy and Medium bulls, which farmer feedback suggests is common practice. This analysis indicates margin per hectare is broadly similar across the three treatments; the Light bulls have a slight advantage over the Medium bulls ($123/ha or 9% more margin) and the Large bulls ($63/ha or 5% more margin). This analysis does not include killing fees and associated levies.

*Table 31: Revenue Comparison*

| Treat | Start Value $/kgLW | Start Value $/head | Carcass Value $/head | Margin | |
|---|---|---|---|---|---|
| | 4/04/18 | 4/04/18 | 12/12/18 | $/bull | $/ha |
| Small Bulls | $2.75 | $1,025 | $1,558 | $533 | $1,440 |
| Medium Bulls | $2.70 | $1,165 | $1,725 | $560 | $1,316 |
| Large Bulls | $2.65 | $1,226 | $1,852 | $625 | $1,376 |

**Discussion:** The demonstration shows interesting trends; the smaller bulls are more productive, with advantages in pasture harvested and liveweight gain. This may be partially a result of less pugging damage, or the eating power from the extra bulls per hectare improving pasture quality in the spring. The increase in pasture cover during November in the larger bull systems had potential to impact on pasture quality in the summer.

Despite being more productive with liveweight gain, the advantage to the smaller bulls is diluted on a production per hectare basis by a lower dressing out percentage (associated with a smaller carcass). The higher purchase price per kg/LW also dilutes the financial benefit, reducing the eventual advantage down from 31% on a liveweight gain basis to 5-9% on a financial margin per hectare basis.

The larger bulls do have more flexibility with disposal, in a dry summer they could have been finished earlier (albeit at lighter weights), which could be an important factor for farms with competing, less flexible classes of livestock (e.g. breeding cows).

The large bulls also showed some potential weakness; the trend toward more pugging damage could become a significant issue on farms with clay soils, which are more vulnerable to pugging.

The techno-grazing system is an excellent platform to compare performance. A design feature of techno-grazing systems is the relatively small mob size of individual bull systems (~5ha). In this demonstration, the largest mob size of 14 bulls is still low compared to typical cell systems. Given the small mob size in this demonstration, mob size is unlikely to have had an impact, but could potentially be a factor in larger cattle systems (e.g. 15 ha at 2.7 bulls/ha = 40 bulls/mob).

## Demonstration 8: Variable Stocking Rate Comparison with a Fixed Stocking Rate

**Location & Year:** Jun-Dec 2017 & Jul-Nov 2018, James Donaldson Farm, Portland, Whangarei

**Summary:** Variable Stocking Rate (Low in Winter, High in Spring) relative to a fixed stocking rate through winter and spring. Compared to the High Stocking Rate, the Variable Stocking Rate:

- Had variable revenue differences between years (-24% to +22%) depending on purchase price premium for spring bought bulls
- Had higher Pasture cover through Spring
- Harvested 8-15% more pasture
- Had 20-50% less pugging
- Produced more liveweight gain (3-26% more)


*R2 Bulls Variable SR*

**Goal:** Compare winter and spring performance of constant stocking rate farmlet ("High Stock") with a variable stocking rate farmlet ("Low Stock" – low winter stocking rate, with extra stock added in spring). The comparison will highlight pasture and animal production, pugging and financial differences.

**Background:** Many cattle systems in Northland operate with a fixed stocking rate through winter and spring; taking the same animals through winter and selling in late spring or summer. This policy does not fit a typical pasture growth curve; there's risks of underfeeding in winter, not being able fully utilise spring pasture growth and increased pugging risk. Running a flexible stock policy with fewer animals in winter, then purchasing extra animals in spring, could better match pasture growth and reduce pugging risk. Historically cattle are expensive to purchase in spring and trading margins can be low, but could less pugging and better pasture growth contribute to better animal growth in the variable stocking rate scenario? The hypothesis was that a flexible stock policy would have less pugging, increased pasture and animal growth to offset the premium for spring cattle purchases.

**Method:** This demonstration was run in 2017 and repeated in 2018. In early winter, systems were allocated to either High Stock (stocked with 2.4 - 2.5 R2 Bulls/ha and run through winter and spring) or Low Stock (stocked with 1.7 bulls/ha through winter, with an additional 1.7 bulls/ha added in September for a total of 3.4 bulls/ha through spring) as outlined in Table 32. The extra bulls added to the Low Stock systems in September were run as a separate mob to minimise behavioural issues (cells were cut in half and the two mobs ran on a 30-day rotation). In 2017 a single system of each treatment was run. In 2018 two systems of each treatment were run (the average of those treatments is presented). In 2017 the bulls were finished in December, in 2018 the November weighing was used as the final liveweight measure.

Pasture cover was assessed visually. Pugging presence was assessed based on 50 points per system.

*Table 32: Overview of the Demonstration*

| | 2017 | | 2018 | |
|---|---|---|---|---|
| | **High Stock** | **Low Stock** | **High Stock** | **Low Stock** |
| System Size (Ha) | 5 | 5 | 7.2 | 7 |
| Bulls/ha (Winter) | 2.4 | 1.7 | 2.4 | 1.7 |
| Bulls/ha (Spring) | 2.4 | 3.4 | 2.4 | 3.4 |
| Starting Liveweight (kgLW/ha) | 979 | 711 | 980 | 665 |

**Average Pasture Cover:** Pasture cover showed a similar trend of higher covers on the Low stocked system through winter across both years. In 2017 pasture cover remained high even after the stocking rate doubled in September. In contrast, pasture cover dropped in 2018 once the extra bulls were added to the Low Stock system.

*Figure 26: Average Pasture Cover 2017*

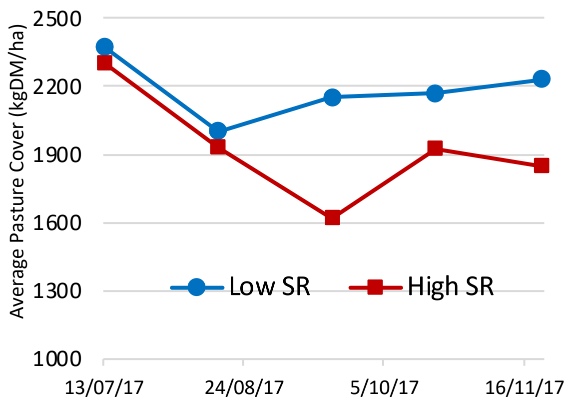
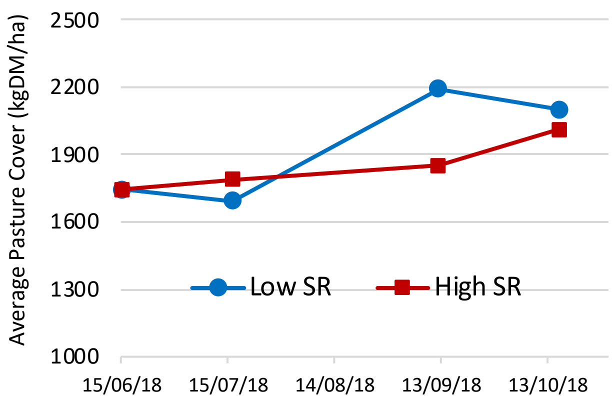



*Figure 27: Average Pasture Cover 2018*




Pasture eaten was estimated using Farmax (Table 33), indicating there was a pasture harvested advantage to the Low Stock system in both years, but this advantage was greater in 2017 (15% more).

*Table 33: Estimated Pasture Eaten (tDM/ha) (summarised from Farmax Analysis)*

| | 2017 (181 days) | 2018 (126 days) |
|---|---|---|
| High Stock (tDM/ha) | 4.85 | 3.19 |
| Low Stock (tDM/ha) | 5.57 | 3.46 |
| Difference (%) | 15% | 8.5% |

**Pugging:** There was a trend of greater pugging damage in the high stock systems (Table 34). The 2018 winter was a drier winter, with less pugging damage generally.

*Table 34: Pugging (Evidence of pugging presence as a % of samples)*

| | 2017 (Oct 17) | 2018 (Sep18) |
|---|---|---|
| High Stock | 57% | 40% |
| Low Stock | 45% | 20% |
| Difference (%) | 15% | 8.5% |

**Animal Production:** Bull Liveweight is outlined in Figures 28 (2017) and 29 (2018). Production is summarized in Tables 35 (2017) & 36 (2018). In 2017 bulls on the Low Stock system had superior liveweight gain both through winter and after the extra bulls were added, gaining an extra 112 kgLW per hectare (26%) compared with the high stocked system. Growth in the introduced bulls was exceptional, averaging 2 kgLW gain per head per day.

In contrast, liveweight gain in 2018 was similar with only a 10kgLWG/ha (or 3%) advantage to bulls in the Low Stock system and similar daily liveweight gain.

*Figure 28: Average Bull Liveweight (kgLW/head) - 2017*

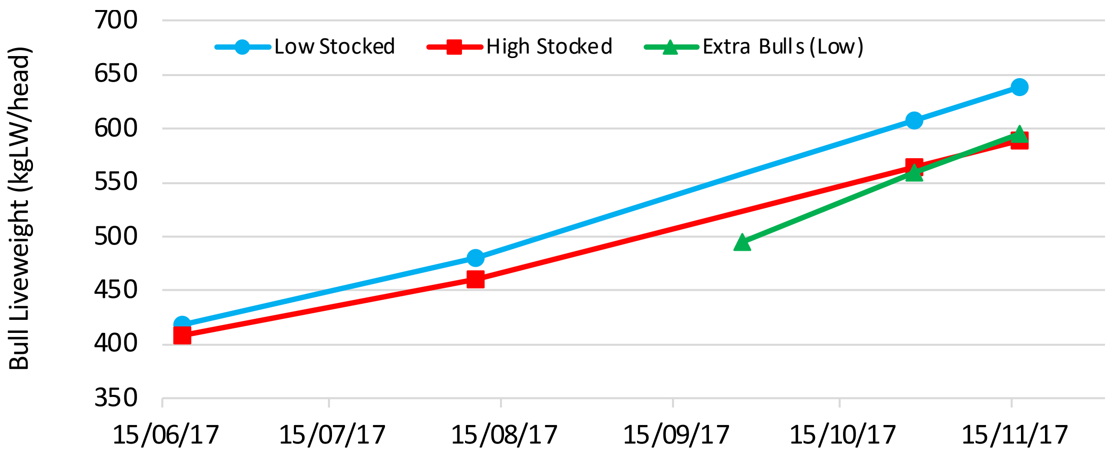



*Figure 30: Average Bull Liveweight (kgLW/head) - 2018*

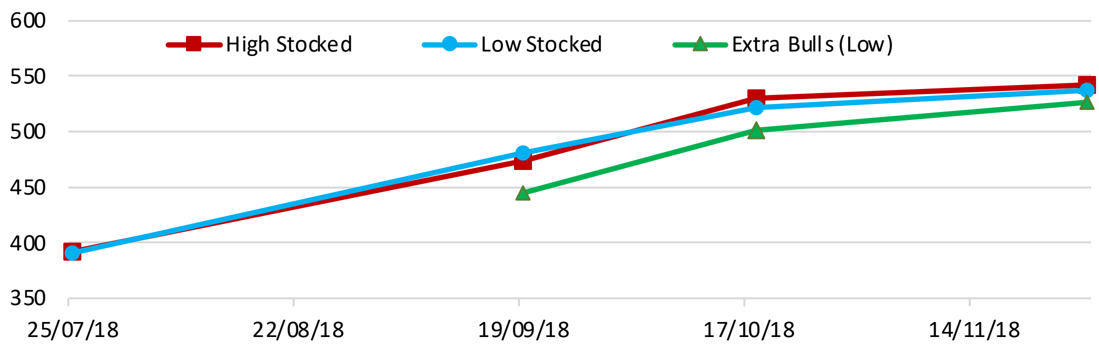



*Table 35: Production Data (2017)*

| | Liveweight (kg/head) | | | Jun-Sep | Sep-Nov | Jun-Nov | |
|---|---|---|---|---|---|---|---|
| **System** | **18-Jun** | **27-Sep** | **16-Nov** | **ADG[1]** | **ADG[1]** | **kgLWG/ha** | **ADG[1]** |
| High Stock | 408 | 523 | 589 | 1.1 | 1.3 | 434 | 1.2 |
| Low Stock | 418 | 558 | 639 | 1.4 | 1.6 | 376 | 1.5 |
| Low Stock - Extra | | 495 | 595 | | 2.0 | 170 | |
| Low Stock Total | | | | 1.4 | 1.8 | 546 | |

[1] *Average Daily Gain (kgLW gain/head/day)*

*Table 36: Production Data (2018)*

| | Liveweight (kg/head) | | | Jul-Sep | Sep-Nov | Jul-Nov | |
|---|---|---|---|---|---|---|---|
| **System** | **25-Jul** | **19-Sep** | **28-Nov** | **ADG[1]** | **ADG[1]** | **kgLWG/ha** | **ADG[1]** |
| High Stock | 392 | 473 | 543 | 1.4 | 1.0 | 376 | 1.2 |
| Low Stock | 391 | 481 | 537 | 1.6 | 0.8 | 248 | 1.2 |
| Low Stock - Extra | | 445 | 526 | | 1.2 | 138 | |
| Low Stock Total | | | | 1.6 | 1.0 | 386 | |

[1] *Average Daily Gain (kgLW gain/head/day)*

**Revenue:** The revenue comparison is outlined in Tables 37 & 38 using estimated prices from those years. In 2017 the combination of extra liveweight gain and good margins in the extra bulls added in the spring ($218/head) contributed to an additional $213/ha margin (22% more than the high stocked system).

In 2018, total liveweight gain was similar between the systems and the margin on the extra bulls added to the low stock system was only $41/head as store price and schedules declined before Christmas. This resulted in the High stock system generating $208/ha more margin (or 24% more than the Low stocked system).

*Table 37: Revenue Comparison 2017*

| System | Starting Value | | | Ending Value | | | Margin | |
|---|---|---|---|---|---|---|---|---|
| | kgLW | $/kgLW | $/head | kgLW | $/kgLW | $/head | $/head | $/ha |
| High Stock | 408 | $2.95 | $1,204 | 299 | $5.36 | $1,602 | $398 | $956 |
| Low Stock | 418 | $2.95 | $1,233 | | | | $470 | $799 |
| Low Stock - Extra | 495 | $3.00 | $1,485 | 316 | $5.39 | $1,703 | $218 | $370 |
| | | | | | | Low Stock Total | | **$1,169** |

*Table 38: Revenue Comparison 2018*

| System | Starting Value | | | Ending Value | | | Margin | |
|---|---|---|---|---|---|---|---|---|
| | kgLW | $/kgLW | $/head | kgLW | $/kgLW | $/head | $/head | $/ha |
| High Stock | 392 | $2.80 | $1,098 | 543 | $2.70 | $1,465 | $367 | $881 |
| Low Stock | 391 | $2.80 | $1,095 | 537 | $2.70 | $1,450 | $355 | $604 |
| Low Stock - Extra | 445 | $3.10 | $1,380 | 526 | $2.70 | $1,420 | $41 | $69 |
| | | | | | | Low Stock Total | | **$673** |

**Discussion:** The demonstration highlights the variation beef farmers grapple with between years, both with pasture growth and pricing.

The 2017 results are typical of what we might expect to see in a wet year – fewer cattle in the Low stock system through winter contributes to reduced pugging. Less competition for feed increases individual bull liveweight gain and contributes to higher pasture cover. Extra cattle added to the low stock system in Spring benefit from higher covers and better pasture growth from less pugging with good individual growth rates. The increase in stocking rate from spring contributes to a net increase in liveweight gain compared to the High stock system. In 2017 the Low Stock system produced an additional 112 kgLWG/ha in total, with liveweight gain from the extra bulls contributing 170 kgLWG/ha; their growth is a major component of the difference.

The 2018 results are typical of what we might see in a drier winter; less pugging damage on the Low Stock system, but also less pugging overall, benefiting the High Stock system. Pasture cover was greater in the Low stock system through winter, but dropped once extra bulls were added and individual liveweight gain from September was similar across both systems. The extra bulls in the Low Stock system also expose the farm to risk of dry weather in spring creating an early feed deficit. The Low Stock system only produced an additional 10 kgLWG/ha overall in 2018 (3% more than the High Stock system).

Variation in pricing between years also contributed to the difference in results – in 2017 store stock prices remained fairly constant through winter – the premium for extra bulls purchased in spring was only $0.05/kgLW (2%), compared to 2018 when the premium was $0.30/kgLW (11% more than bulls purchased in winter).

Using long term price trends removes this annual variability to show the underlying impact of the production difference between years. Using long term price trends suggests a $2.65/kgLW for cattle purchased in winter would equate to $2.92 for cattle purchased in spring (27c/kgLW premium) and sale prices of $2.72/kgLW in November and $4.95/kgCW in December. The revenue difference from using these long-term prices are outlined in Table 39 and indicate less potential for upside with the variable stocking rate scenario, even in 2017 where there were substantial production gains in the Low stock system.

*Table 39: Revenue ($/ha)using Actual prices and Long Term Pricing[1]*

| | 2017 Revenue ($/ha) | | 2018 Revenue ($/ha) | |
|---|---|---|---|---|
| | **Actual Prices** | **Long-Term Prices** | **Actual Prices** | **Long-Term Prices** |
| High Stock | $956 | $957 | $881 | $1048 |
| Low Stock | $1169 | $975 | $673 | $945 |
| Low Stock Advantage | $213 (+22%) | $18 (+2%) | -$208 (-24%) | -$103 (-10%) |

*[1] Long Term pricing based on seasonal trends at an annual average bull schedule of $5/kgCW ($2.65/kgLW in Jun/Jul, $2.92/kgLW in Sep, $2.72/kgLW in Nov & $4.95/kgCW in Dec)*

To offset the risk of purchase premium in spring bought stock, the Low stock system needs to replicate the 2017 results; rapid liveweight gain through winter and sufficient pasture for the extra bulls to grow quickly once they are added in spring. Differences between the Low/Variable stock and High/Fixed stock systems may be more obvious in wet years or on farms with wet, soils that are prone to pugging.

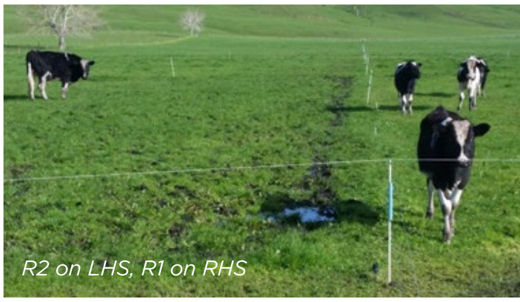
Having a lower stocking rate through winter has other advantages – there's less pugging, animals are growing faster and there's less potential for underfeeding in a difficult winter. A key risk for the Low Stock system would be sourcing enough extra cattle in spring without paying a premium that would damage margins.

## Demonstration 9: R1 vs R2 Cattle

**Location & Year:** May – Nov 2017. Dennis & Rachelle O'Callaghan, Temataa Station, Doubtless Bay, Far North

**Summary:** Relative to R2 Bull systems, R1 Bull systems:

- Had 35-41% more revenue per hectare
- Harvested 0.7 tDM/ha more pasture (12%)
- Had 36% less pugging damage
- Had 72% more Liveweight gain per hectare


*R2 on LHS, R1 on RHS*

**Goal:** Compare the performance of R1 and R2 bull systems on pasture and animal production, profitability and pugging

**Background:** Pugging is an issue on many Northland soils in the winter, leading to a preference for younger cattle systems. The hypothesis was younger cattle would create less pugging damage which would increase pasture growth, animal production and profitability.

**Method:** In Late May 2017 a four-lane techno-grazing system was stocked with two lanes of R1 Friesian bulls (10 month) and two lanes of R2 Friesian bulls (22 month) as outlined in Table 40. Based on farmer feedback, the R2 bulls were stocked at a higher starting liveweight per hectare (common practice on farm). Each lane was 4.3 ha and received the same management; rotation length started at 60 days on the 24th May, speeding up to 45 days on the 1st August and 30 days from the 1st September. The demonstration concluded on the 17th November (178 days).

*Table 40: Overview of the Demonstration (average of the 2 replicates)*

| | R1 Bulls | R2 Bulls |
|---|---|---|
| Area | 4.3 ha | 4.3 ha |
| Bulls (R1 Friesian) | 25 | 11 |
| Avg LW (24/6/16) | 146 kg/head | 401 kg/head |
| Bulls/ha | 5.8 | 2.6 |
| kgLW/ha | 866 | 1026 |

Pasture cover was assessed visually (pugging damage meant the rising plate meter was not accurate), pugging damage assessed twice for each system (August and October). Pre-graze pasture samples were assessed for species and composition (dissection) and feed quality (lab analysis).

**Average Pasture Cover:** There was a slight advantage in pasture cover to the R1 bulls throughout the demonstration (Table 41), but generally pasture cover was similar.

*Table 41: Average Pasture Cover (Visual Assessment)*

| Average Pasture Cover | 5/7/17 | 11/8/17 | 25/10/17 | 23/11/17 |
|---|---|---|---|---|
| R2 yr Bulls | 1874 | 1542 | 1621 | 2163 |
| R1 yr Bulls | 1974 | 1583 | 1693 | 2188 |

Despite pasture cover being similar between the systems, Farmax analysis (Table 42) indicates more pasture was harvested in the R1 bull system than the R2 bull system and the R1 bulls were more efficient at converting pasture to liveweight gain.

*Table 42: Summary of Farmax Analysis*

| | Pasture Eaten (tDM/ha) | Production[1] (kgCWe/ha) | Feed Conversion Efficiency[2] (kgDM/kg Product) |
|---|---|---|---|
| R2 Bulls | 6.0 | 363 | 16.5 |
| R1 Bulls | 6.7 | 468 | 14.3 |

*[1] Production as Carcass equivalent kgCWe/ha*
*[2] Feed Conversion Efficiency (kgDM required to produce 1 kg of Product)*

**Pasture Species & Feed Quality:** There was no substantial difference in pasture quality or species between the treatments during the demonstration (Table 43).

*Table 43: Pasture Quality (MJME/kgDM)*

| Pasture Quality | 5/7/17 | 11/8/17 | 25/10/17 |
|---|---|---|---|
| R2 yr Bulls | 9.9 | 11.4 | 11.1 |
| R1 yr Bulls | 10.2 | 11.3 | 10.7 |

**Pugging:** There was more pugging in the R2 bull systems in both the August and October assessments:

*Table 44: Visual Pugging (% of 55 points)*

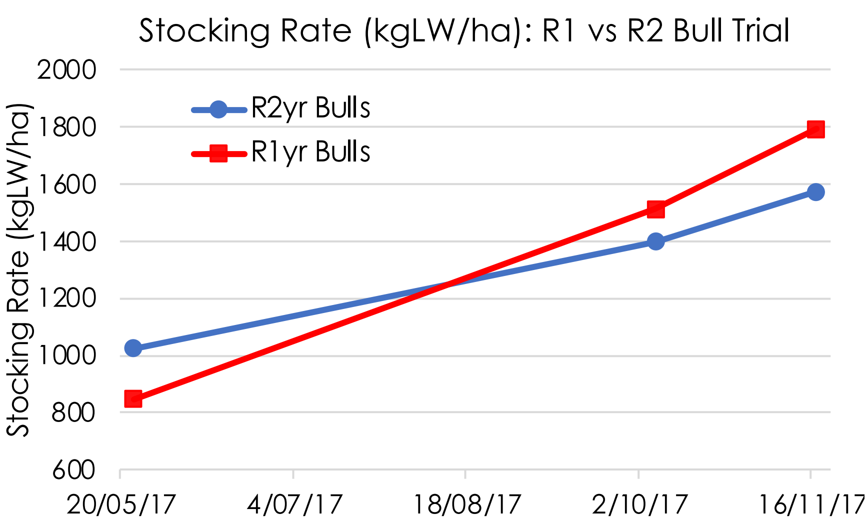
| | 11/8/17 | 25/10/17 |
|---|---|---|
| R2 Bulls | 42% | 78% |
| R1 Bulls | 23% | 50% |

**Animal Production:** Animal production is outlined in Table 45 and Figure 31. Over 178 days of the demonstration, the R1 Bulls grew at an average of 0.93 kgLWG/head/day compared to the R2 Bulls growing an average of 1.24 kgLWG/head/day. The higher stocking rate (5.8 bulls/ha vs 2.6 bulls/ha) meant liveweight gain per hectare was much higher in the R1 bull systems (by 395 kgLWG/ha or 72% more).

*Table 45: Animal Production Comparison (liveweight)*

| | Stocking Rate | Starting KgLW/ha | kgLW/head | | Gain | | Daily Gain |
|---|---|---|---|---|---|---|---|
| | | | 23/05/17 | 17/11/17 | kgLW/hd | kgLW/ha | |
| R1 | 5.8 | 849 | 146 | 312 | 166 | 941 | 0.93 |
| R2 | 2.6 | 1026 | 401 | 622 | 221 | 546 | 1.24 |

*Figure 31: Stocking Rate (kgLW/ha) through the Demonstration*



**Revenue:** The potential revenue differences assuming the bulls were sold at the end of the demonstration (in November) are estimated using both the 2017 market price (Table 46) and the long term price (Table 47 - based on a long term price equivalent to $5/kgCW). In both pricing scenarios, the R1 bull system would generate ~$630/ha more revenue or between 33% (long term prices) – 41% (2017 price) more margin per hectare than the R2 bull system.

*Table 46: Indicative Revenue ($/ha) using 2017 pricing*

| | Start Value (May) | | End Value (Nov) | | Margin | |
|---|---|---|---|---|---|---|
| **2017 Prices** | **$/kgLW** | **$/head** | **$/kgLW** | **$/head** | **$/head** | **$/ha** |
| R2 | $2.90 | $1,163 | $2.84 | $1765 | $602 | $1,540 |
| R1 | $3.95 | $577 | $3.05 | $950 | $373 | $2,171 |

*Table 47: Indicative Revenue ($/ha) using Long Term pricing ($5/kgCW equivalent)*

| | Start Value (May) | | End Value (Nov) | | Margin | |
|---|---|---|---|---|---|---|
| **Long Term** | **$/kgLW** | **$/head** | **$/kgLW** | **$/head** | **$/head** | **$/ha** |
| R2 | $2.52 | $1,011 | $2.85 | $1771 | $761 | $1,946 |
| R1 | $3.25 | $475 | $2.95 | $919 | $444 (-42%) | $2,584 (+33%) |

**Discussion:** This demonstration confirmed the hypothesis that R1 cattle create less pugging damage, contributing to more pasture growth and animal production. The level of performance achieved in this demonstration was higher than anticipated for both systems, but particularly for the R1 bull systems. Feed conversion efficiency was exceptionally good and overall liveweight gain was good across both systems.

The soils in this demonstration are very typically winter wet, they are podzolised soils with a pan which impedes drainage. There was a substantial difference in pugging damage and while the heavier R2 cattle created more pugging, pugging damage was relatively high on both systems (due in part to the wet winter in 2017). Less pugging damage did not equate to a substantial pasture cover or pasture quality advantage for the R1 bull system but given the increase in animal production and pasture eaten, there must have been an overall pasture growth advantage.

The high performance observed in this demonstration, along with the difference in performance between the R1 and R2 bull systems, suggest the stocking rate was appropriate.

Pugging damage appears to be a key driver for the production differences between these systems and suggests the practice of running R1 cattle systems on soils prone to pugging is a good option. These results may not apply to free-draining soils or areas where winter and spring rainfall does not contribute to pugging damage.

beef+lamb
new zealand