

# AgResearch Bale Grazing - Dr Ross Monaghan, Chris Smith and Dylan Ditchfield

## Soil Armour

### Bale grazing for preserving soil armour and soil function - another option for cow wintering

1 What is bale grazing? Bale grazing uses established pasture and a grid of pre-placed hay bales to winter cows.

A winter bale grazing system is being compared to a winter-grazed kale crop at a site in northern Southland to see if it provides benefits for soil and water quality, and cow welfare. The project has almost completed its third year of measurements and some preliminary messages have emerged.

Soil conditions are better than observed for kale-grazed plots, as evidenced by scores for soil roughness, pug depth, infiltration rate and Visual Soil Assessment.



2 How fast does pasture recover? Pasture recovery following winter grazing is reasonably rapid.



Immediately  
after grazing

17 June



4 weeks  
after grazing

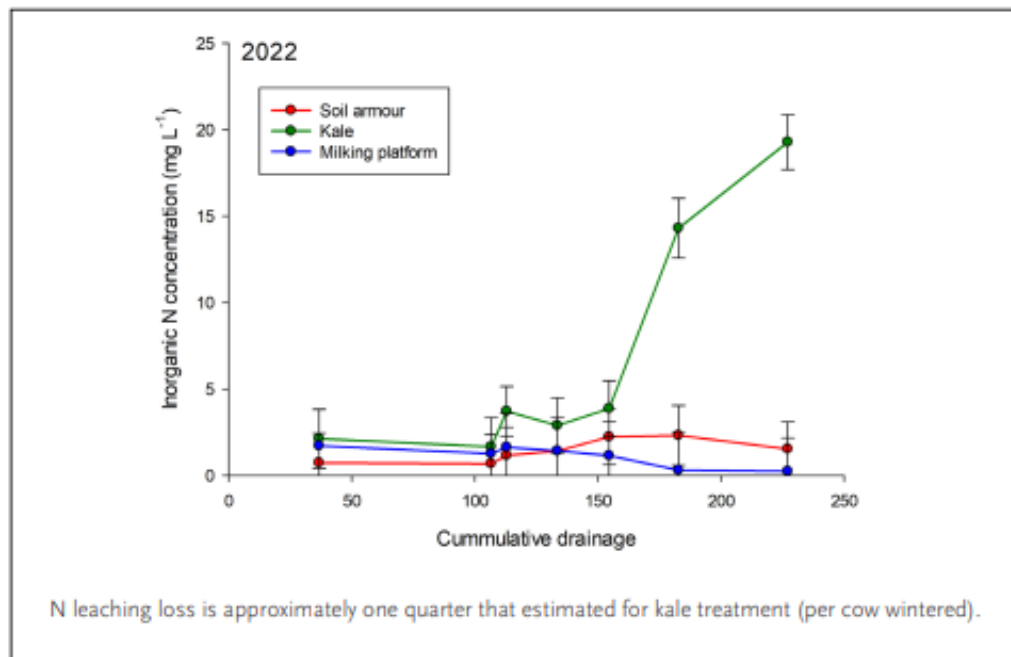
41% less bare soil



10 weeks  
after grazing

<10% bare ground

### 3 What about nitrate leaching? Nitrate leaching losses (2022) are lower, on both a per hectare and per cow wintered basis.



### 4 Do the cows like it? Cow comfort is greater for bale grazing cows (2022 monitoring).

Bale grazed cows:

- Spent more time lying and in postures indicative of greater thermal comfort
- Spent more time ruminating
- Were warmer (skin temperature) and cleaner



#### Suggested Design Criteria

Grazing pressure of 16 m<sup>2</sup>/cow/day

For 100 cow mobs: feed 0.5 ha (3,000 – 4,000 kg DM/ha covers) in 3-day breaks with 15 large round hay bales

A well-drained soil helps

## ***Bale Grazing information – Farmers Observation/Perspective***

### **Freedom Acres Dairy Farm**

- 163 ha effective / 158 ha milking platform Runoff (lease) 128 ha effective
- Stock 390 cows – Cross breed. 100 Heifers - Friesian /Cross breed
- Production 170,000 kgMS
- Team /staff 2 permanent
- Pastures 40% multi species, 60% perennial ryegrass and white clover
- Soil Matura silt loam
- Time practicing RA 4 years regenerative farming practice
- N fertiliser use 10 units N/ha
- Wintered 80% bale grazing / 20% kale crop

**“Bale Grazing”** is a practice originating from the US as part of some regenerative farming systems. Apart from winter feeding livestock, the practice is used to improve the soil outcomes mainly from the bale litter left behind. The bale litter has seed that germinates, and the grasses established from the bale litter combined with the increasing temperatures, break down the litter to feed the biology in the soil which in turn transform the soil to become biologically active improving nutrient availability, infiltration, soil structure and pasture growth to name a few benefits.

**Our journey** – In our first season bale grazing we started off by trailing 3 paddocks, on which we calved our cows on. The next season we wintered half the herd, and this season we wintered  $\frac{3}{4}$  of our herd plus all youngstock on bale grazing. We plan to be 100% bale grazing all livestock this coming year.

### **Findings - Pasture / Soil**

Improved soil /pasture - Bale litter areas result in improved soil health achieving increased pasture growth and quality in the bale litter areas.

Bale seed - What seed is in the bale is what grows after in the bale litter areas.

Soil insulation - Bale litter insulates the soil under it, resulting in early germination of the bale seed to assist in the pasture establishment and bale litter breakdown.

Back in rotation - On the dairy platform, after calving our cows on the bale grazing paddocks the bale grazing paddocks are normally back into rotation by the middle of the second round (mid- October)

Pasture repair - We direct-drill with perennial pasture seed full sowing rate approx. 2-3% of the total area where pasture damage has occurred, and half rate on 8-10% of mild pasture damage.

### **Animal behaviour /welfare observations –**

Cows don't walk around (compared to cows on crop) as they are fully feed and often ruminating on the hay, decreasing pasture damage.

Rumination creates body heat, and is observed in cold condition where cows seem more settled with full bellies on bale grazing than on winter conventional crops.

The bale litter insulates the soil, which influences cows to lie on bale litter rather than bare ground, requiring less energy to maintain body condition/temperature.

Majority of calving cows calve on bale litter, resulting in decrease calf mortality and better cow health.

### **Bale grazing setup guidelines –**

- Shut-up paddocks early enough ideally to have 3500-4000 kgDM/ha pre-grazing cover before grazing. (March- early April depending on timing of grazing)
- Set out hay bales in a grid formation at approx. x30 bales / ha (approx. 18-20 metres apart)
- When budgeting, allow 15-20% extra to what is needed in theory allowing for wetter conditions to manage and minimise pasture damage. (70 days wintering for 100 cows = 13.6 ha + 408 bales)
- Recommend using the same paddock for the following year, placing bales in different position each year to eventually cover the whole paddock with bale litter over 3-4 winters/grazings

### **Grazing cow method –**

- 100 cows offered ½ ha every 3 days (back fenced and offered water, use square breaks where possible)
- Normally leave bale on round edge, taking off netting before feeding break. (On steeper slopes roll onto side to prevent rolling off down the hill from playful cows)
- Feed **WITHOUT** bale racks. Cows eat approx. 80% of bale leaving 20% as bale litter.
- When wet weather events occur and pasture damage is starting to occur, move cows on to next break, coming back to the unfinished break once soil conditions allow (dry out)

### **Paddock Selection / Feed quality –**

- Paddock selection is important. Harder to do on steep sidling's.
- Keep bales and water troughs out of hollows or potential ponding areas.
- The better the pasture and hay quality, the better weight gain results
- Hay bales - 4x4 or 5x4 round bales work best. Can use squares if placed not long before grazing.
- Can use baleage. Use dryer mature baleage with seed if possible. Hand sowing baleage patches with seed after grazing can be effective.
- Seed in the bale is important to achieve natural reseeding after the bale litter breakdown.
- We have bale grazed on freer draining and heavier soils generally with little difference in the damage to pasture, however heavier soils have pug easier when soil reaches saturation. How you manage this is key to minimising damage.

### **Pros**

- Less N leaching
- Live plant in the ground all year round
- Minimal pasture damage
- Very little to no sediment runoff
- No cultivation / sprays / crop establishment costs
- Improved better functioning soil
- Easy wintering (shift every 3 days/ staff love it!)
- Better livestock welfare
- No massive feed transitioning for livestock
- Livestock require less feed (ME) to maintain body condition

### **Cons**

- Require more area than conventional crop wintering (double to cropping)
- More challenging to make hay in Southland/ South Otago
- Feed (hay) ME is lower
- Mindset change – Hard to get your head around if you've told you can't winter cows on grass in Southland.

### **Trial Bale grazing - (without bale racks)**

1. Start small - Start off with just one paddock, or a couple of hectares.
2. Place round hay bales (of reasonable quality) in a grid at a density of 30 bales/ha (18 metre spacings)
3. Use any sized mob of cows and feed off x3 day breaks proportionate to - ½ ha per 100 cows / 3 days.
4. A rough guide for different mob sizes- x6-7 cows/bale every 3 days. For youngstock approx. 12 yearling heifers/ bale every 3 days (We used ½ hay and ½ baleage for youngstock)

### Considerations when deciding on a wintering practice / system –

- Consider the wintering practice and how it effects your farming system as a whole?
- When looking at the Ditchfield’s cost comparisons, consider what the numbers don’t include- like the advantages that improved soil biology/functioning would bring from the bale grazing system compared to the conventional cropping.
- Be careful not to let feed ME dominate your decision on what system you choose. Include issues like- animal welfare, people (labour required), soil integrity, environmental footprint, cost of energy (fuel), feed transitioning. These are just as important issues to consider when farming today and thinking of farming into the future.
- **What is possible that you are currently thinking is impossible.**

### Comparison of wintering costs: hay bale grazing vs kale grazing vs off-farm grazing

The table below compares the relative wintering costs of three different modelled options for Southland dairy farmers; hay bale grazing, conventional kale crops and grazing off farm. It uses winter 2021 price estimates so there will be differences now with current price increases.

With approximately 75% of the hay/baleage made on-farm in both the kale and bale grazing options, conventional kale grazing is slightly more cost effective, until the opportunity cost of ex-kale paddocks awaiting resowing in spring is factored in.

400 Cows - Bale Grazing (hay + grass)		400 Cows - Kale Grazing (kale + baleage)		400 Cows - Off Farm Grazing	
<b>54ha</b>		<b>54ha</b>		<b>0ha</b>	
<ul style="list-style-type: none"> <li>• 100 cow mobs</li> <li>• Fed 0.5 ha (3000-4000 kgDM cover) + 15 bales every 3 days</li> <li>• 1620 hay bales total                             <ul style="list-style-type: none"> <li>• 1214 made on farm</li> <li>• 406 purchased</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>• 28 ha of 10 TDM crop</li> <li>• 26 ha baleage cut at 8 TDM</li> <li>• 10 kgDM of kale fed per day</li> <li>• 5 kgDM of baleage fed per day</li> </ul>		<ul style="list-style-type: none"> <li>• Off farm for 70 days</li> </ul>	
		Crop seed and spray @ \$275/ha	\$7,700	400 cows @ \$36/day for 10 weeks	\$144,000
		Crop drilling @ \$90/ha	\$2,520	Trucking Costs – location dependent	Variable
		Crop fert @ \$400/ha	\$11,200		
1214 hay bales (~300kgDM) made on farm @ \$15/bale	\$18,210	770 bales (~270kgDM) made on farm @ \$29/bale	\$22,330		
406 hay bales (~300kgDM) purchased @ \$69	\$28,014	252 bales (~270kgDM) surplus @ \$85/bale	-\$21,420		
		Regrassing seed and spray @ \$370/ha	\$10,360		
		Regrassing cultivation and drilling time and diesel @ \$253/ha	\$7100		
		Regrassing Fert @ \$250/ha	\$6,500		
Land lease @ \$593/ha	\$32,022	Land lease @ \$593/ha	\$32,022		
Vehicles	\$4,000	Vehicles	\$4,000		
Fertiliser @ \$270/ha	\$14,580	Fertiliser @ \$270/ha for 26 ha	\$7,020		
Rates/R&M	\$2,000	Rates/R&M	\$2,000		
		Opportunity cost of grass not grown while new grass establishes (154 TDM @ 24c/kg)*	\$36,000		
<b>Total</b>	<b>\$96,826</b>	<b>Total</b>	<b>\$91,332-127,332</b>	<b>Total</b>	<b>\$144,000</b>



**Figure 12: Good soil armour pre grazing on bale grazing**



**Figure 13: Fully fed content cows on bale grazing**



**Figure 14: Plenty of scope for animal wellbeing while protecting the soil**



**Figure 15: Live roots and growing plants after grazing**



**Figure 16: Hay Insulation effect**



**Figure 17: Superior grass growth from the bale litter bringing soil biology to life**