Holbrook Landcare Network

NSW GOVERNMENT Department of Primary Industries and Regional Development

1st November 2024

Morven lime trial site

Background

- Established 25th October 2019.
- Established with funding that Holbrook Landcare Network received from the Australian Government's National Landcare Program along with cash co-contributions from Grasslands Society of NSW and Holbrook Landcare Network, and in-kind support from NSW DPI
- Steering committee made up of local producers, advisors and researchers from NSW DPI and Charles Sturt University developed the trial plan.

Paddock history

- Old phalaris pasture stand (20-30 years?).
- Yellow Chromosol. Severely acidic with avg. pH_{Ca} of 4.2 and 30% Exch Al at 5-20cm.
- Uniform soil – EM survey done on the paddock to locate a uniform patch for the trial.

Treatments

- 28 plots (7 treatments replicated 4 times), 63m × 9m in size.
- 3 buffer strips (sulphur treatment) between each replicate, 63m x 6m in size.
- Lime sourced from NSW crushers, with a neutralising value of 97 and fine particle size (96% passing through a 250 µm sieve) was applied using a direct drop lime spreader.
- Incorporation was completed with two passes of a disc harrow and one pass of a scarifier.
- Small rates of lime were required to 'top-up' Treatments 2 (1.5 t/ha), 3 (1.5 t/ha) and 6 (0.7 t/ha) in October 2024 as soil pH had decreased to near critical levels.
- NSW DPIRD 'Species Trial' oversown on existing lime treatments in September 2023, 'Serradella Trial' established to the side of existing lime treatments.

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Rep 1										Rep 2										Rep 3										Rep 4					
4 3t/ha	6 2t/ha	10	3 4t/ha	5 3t/ha	7 6t/ha	2 4t/ha	S0	5 3t/ha	6 2t/ha	4 3t/ha	10	2 4t/ha	3 4t/ha	7 6t/ha	S0	2 4t/ha	7 6t/ha	6 2t/ha	5 3t/ha	3 4t/ha	10	4 3t/ha	S0	10	3 4t/ha	7 6t/ha	4 3t/ha	6 2t/ha	5 3t/ha	2 4t/ha
														Species Trial																

Morven site plan. Treatment numbers up the top and lime rates (t/ha) below. New NSW DPI 'Species Trial' shown in red.

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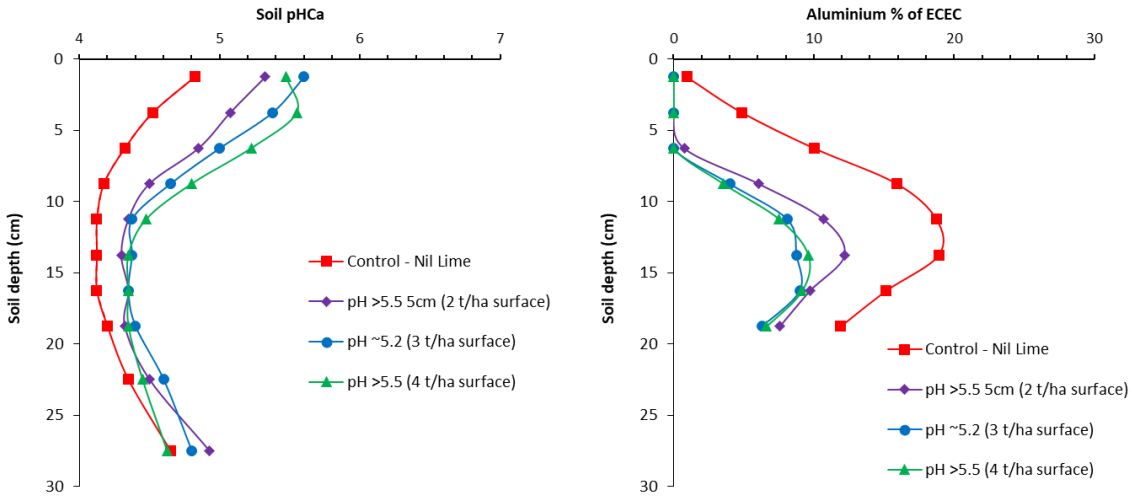
Treatment	Treatment pH_{Ca} target	Lime rate (t/ha)	Comment
1	-	0	Control
2	>5.5 (0-10cm)	4	Surface applied. Trigger for re-liming at pH 5.5 in 0-10 cm layer
3	>5.5 (0-10cm)	4*	**Incorporated**. Trigger for re-liming at pH 5.5 in 0-10 cm layer
4	~5.2 (0-10cm)	3	Surface applied. Trigger for re-liming at pH 5.0 in 0-10 cm layer
5	~5.2 (0-10cm)	3*	**Incorporated.** Trigger for re-liming at pH 5.0 in 0-10 cm layer
6	>5.5 (0-5cm)	2	Surface applied. Trigger for re-liming at pH 5.5 in 0-5 cm layer
7	>5.5 (0-20cm)	6*	'Once-in-a-generation' treatment. **Incorporated.** Chosen to ameliorate acidity and prevent acidification in the long-term with a single incorporation. It will also test if high lime rate will induce nutrient deficiencies or toxicities.
S			200 kg/ha Elemental sulphur applied to acidify soil

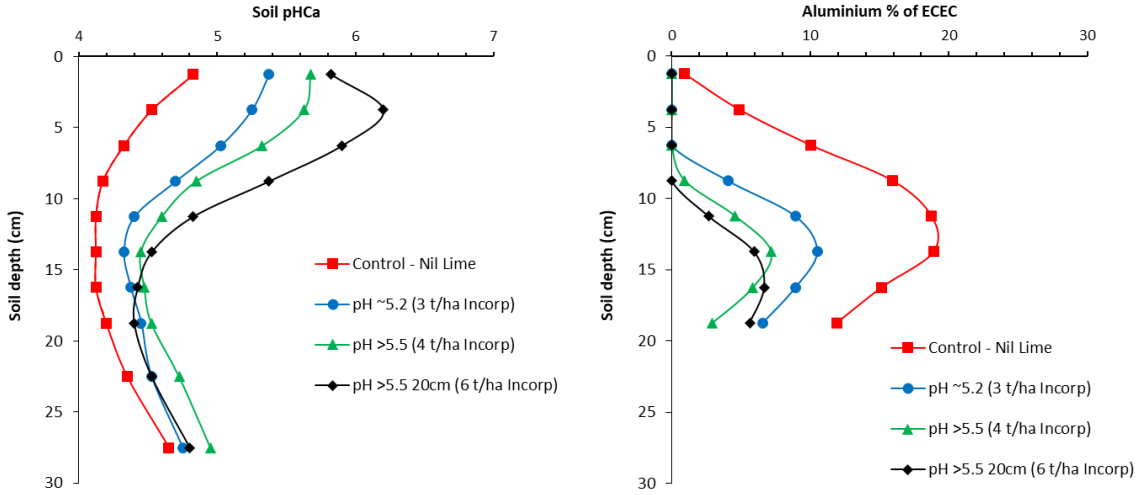
Crop details

Year	Crop	Comment
2020	Canola (Hyola 970CL)	
2021	Wheat (Anapurna)	Yield – 3.2 t/ha (nil lime), 5.5 t/ha (pH ~5.2), 5.6 t/ha (pH >5.5)
2022	Canola (Hyola 970CL)	Crop was rained out and grazed
2023	Pasture	Phalaris and subclover sown 31st May 2023 – washed out Lucerne and chicory sown 13th September 2023 – current

Soil results



The soil profiles for pH_{Ca} and exchangeable aluminium percent for the surface applied treatments at the Morven replicated trial site, sampled February 2024 (4 years and 4 months post liming).

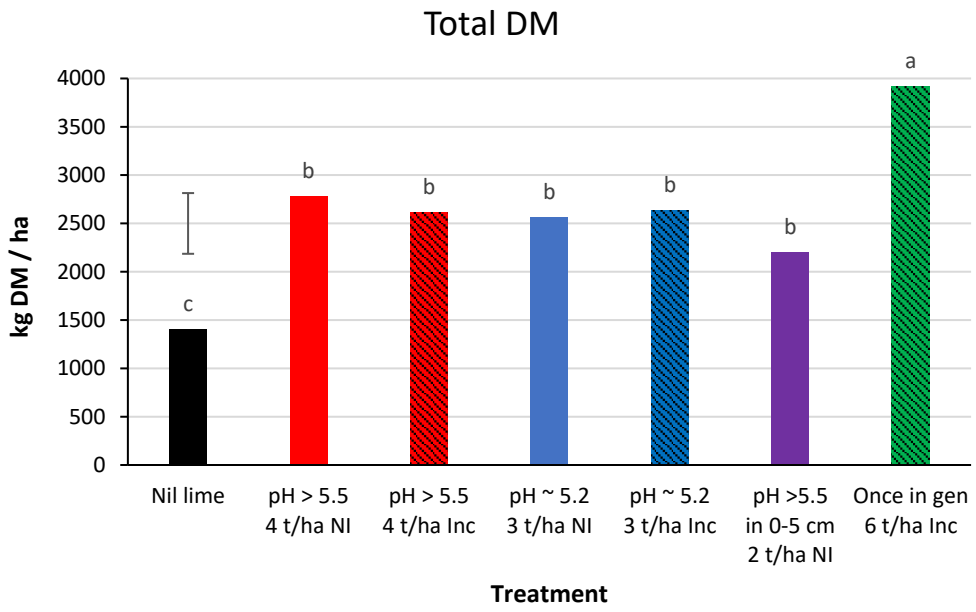


The soil profiles for pH_{Ca} and exchangeable aluminium percent for the incorporated treatments at the Morven replicated trial site, sampled February 2024 (4 years and 4 months post liming).

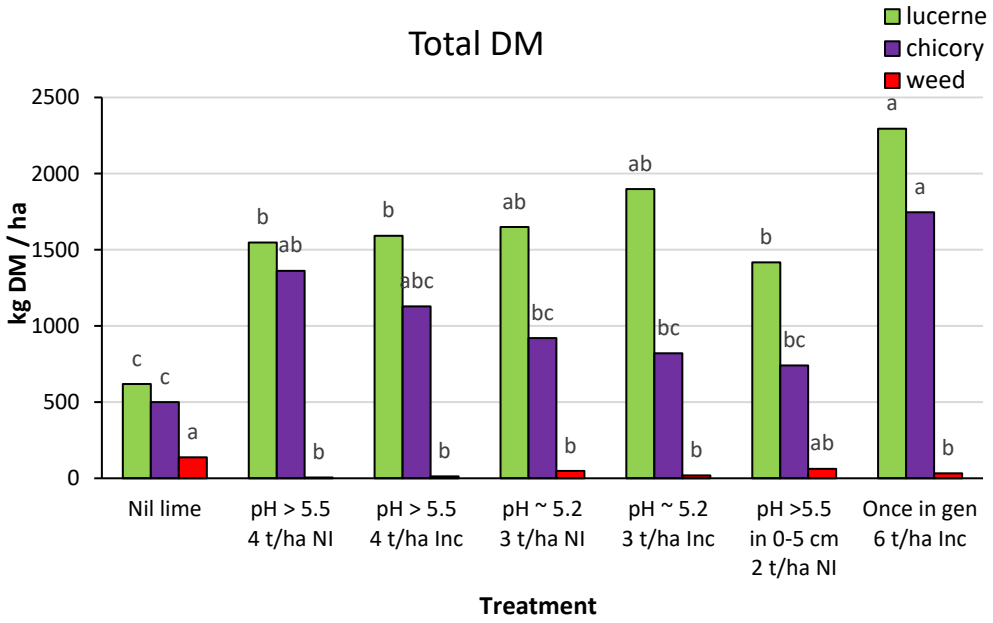
Pasture measurement results

Pasture measurements including total dry matter (DM) and species composition were completed at the site on the 18thSeptember 2024. Stock had been excluded from the paddock since June and these measurements captured the first flush of Spring growth. Key findings were:

- Total DM was significantly greater in all limed treatments compared to the control (nil lime).
- The 'once in a generation' upfront lime rate of 6 t/ha (and incorporated) had significantly higher DM than all other treatments.
- The control (nil lime) treatment had significantly less lucerne and more broadleaf weeds/annual grasses compared to the other treatments. This highlights how addressing soil acidity can form part of integrated weed management i.e. acid soil = constrained lucerne = opportunities for weeds to colonise.



Vertical bar indicates least significant difference (L.S.D) (P<0.05). L.S.D = 628



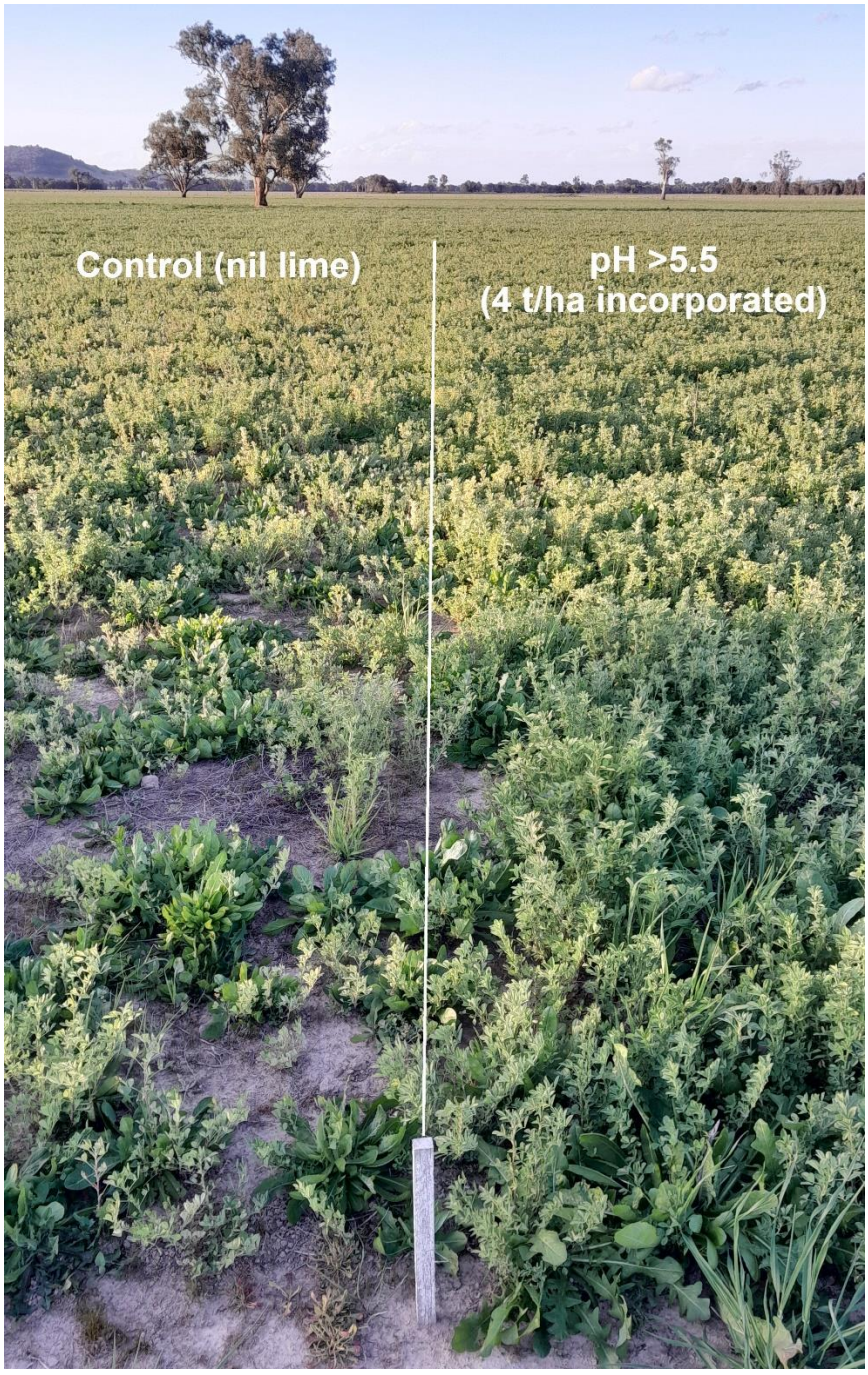
Different letters above bars indicate a significant difference between treatments (P<0.05).

Acknowledgements

The Morven replicated lime trial site was established under the Australian Government's National Landcare Program funded project 'New approaches to tackling and monitoring soil acidity', NLP-12074, started: 1/07/2019; completed: 31/03/2022. A GRDC funded project 'Action learning on crop response to acid subsoil stratification and amelioration benefits', UCS2204-001RTX, funded trial site activities from 2022 to 2024.

The technical support from Dr Jason Condon of Charles Sturt University, Helen Burns, Dr Richard Hayes, Anne-Maree Farley, Richard Lowrie, Andrew Price and Peter Tyndall of NSW DPIRD is greatly appreciated.

The contribution of the participating landowner hosting the site is greatly appreciated.



Stunted lucerne plants, more bare ground and weeds visually evident in the control (nil lime) plots.

Control (left) and treatment targeting pHCa >5.5 in the 0-10cm layer (4 t/ha lime incorporated) (right). Healthier plants and better root growth on the right. Yellow colour in the left soil core indicates soil pHCa of 4.0-4.5. Purple to green colour in the right core indicates pHCa of about 5.5 to a depth of 10-15 cm.