



Increasing soil fertility at Bookham

Does higher soil fertility affect pasture resilience?

Having resilient, high quality pastures is a major factor in determining a livestock producer's ability to be productive, make a profit, and endure variable climatic conditions.

Soil fertility is a key influence on pasture performance, however, there are many approaches to building soil fertility, with various amendments available.

Aim

Assess the ability of various fertilisers and soil amendments to increase soil Colwell P to optimal level over a 5-year time frame and provides the right balance of nutrients to ensure plant growth is not limited by P or S as soil fertility is built over time.

Site

The trial, located at the Hazell's property 'Kia-Ora', Bookham, NSW was established in August 2023 by the Holbrook Landcare Network, Bookham Agricultural Bureau and Local Land Services as part of the SNSW Innovation Hub's Resilient Pastures project funded through the Future Drought Fund.

The chosen site was of low soil fertility, with a Phosphorus (Colwell P) of 9 mg/kg and Sulfur ($S KCl_{40}$) of 3 mg/kg — indicating P and S are limiting growth by a similar extent. Soil pH ($CaCl_2$) measured 4.4 with 29% aluminium present.



Figure 1: An aerial view of the Bookham fertiliser trial site showing the layout of 10 different treatments with 3 replicates (Source: Holbrook Landcare Network, 2023).

The pasture consists of native perennial grasses (microlaena and wallaby grass), subterranean clover and annual grasses.

No seed is to be added throughout the course of this demonstration to avoid compounding influences on pasture composition.

The trial follows the Five Easy Steps P management program, developed by CSIRO and NSW Department of Primary Industries, aiming to build soil phosphorus levels by 22 units, from 9 mg/kg to 31 (considered optimal for this site) over a 5-year time frame. Using the Five Easy Steps approach, it was determined an annual application of 18.8 kg/ha P is required.

Treatments

The trial consists of 10 treatments (Table 1), replicated 3 times, with each plot measuring 5 m x 2 m. Soil testing, pasture assessment and the application of treatments will occur annually.

Table 1. Treatments used in the Bookham Resilient Pastures Trial

(Source: Fiona Leech, LLS).

Treatment	Rate Applied	P:S Ratio (nominal)	P & S Applied (kg/ha)
Control	-	-	-
Lime	3 t/ha	-	-
Single super	214 kg/ha	1:1	18.8 P 23.5 S
Single super + lime	214 kg/ha 3 t/ha	1:1	18.8 P 23.5 S
TriplePluS	104 kg/ha	2:1	18.8 P 11.5 S
TriplePluS + Gypsum	104 kg/ha 210kg/ha	1:2	18.8 P 37.6 S
Agri-ash	694 kg/ha	3.6:1	18.8 P 5.3 S
Agri-ash + Gypsum	694 kg/ha 147 kg/ha	1:1	18.8 P 23.5 S
Agri-ash	2500 kg/ha	3.6:1	67.8 P 19 S
Agri-ash + Gypsum	2500 kg/ha 241 kg/ha	1:1	67.8 P 49 S

What will this tell us?

This trial will provide producers with knowledge of which fertiliser and soil amendment mix provides the right balance of nutrients to ensure plant growth is not limited by P or S as soil fertility is built over time.

“Further investigation is focused on understanding the management of sulfur in pastures.” – Fiona Leech, Senior Agriculture Advisor, LLS

A financial analysis will assess which treatment is the most cost effective based on the increased pasture growth and soil fertility delivered.

Another useful aspect of this trial will be the ability to observe the change in botanical composition of the pasture as the soil fertility builds. Generally, legumes like subterranean clover perform better under higher soil fertility and less acidic soils. Building legume content in the existing native perennial grass pasture by applying P and S will improve rates of nitrogen fixation as well as raise the overall feed quality on offer to livestock.



The fertiliser trial site at Bookham



Field day goers listen to a discription by Fiona Leech (LLS) of the trial at the introductory field day on 21st May 2024 (Source: Suzannah Cowley).

Results

The project is currently set to run for a 5-year period wrapping up in 2028.

An introductory pastures field day was held at the site on the 21st May 2024. Only preliminary data has been collected, with no visual treatment differences apparent in the pasture at this time, however, there was a keen interest within the local agricultural community regarding the work.

The author would like to thank the Hazell family for hosting this trial, Steph Cowley and Alison Southwell from the Holbrook Landcare Network and Fiona Leech from South East Local Land Services for setting up, maintaining, and conducting field work and data collection on this trial.

“I am looking forward to the findings so I can see which fertiliser will give me the most bang for my buck.” – David Hazell, Owner of ‘Kia-Ora’

Acknowledgements: Creating Landscape-scale Change through Drought Resilient Pasture Systems, otherwise known as ‘FDF Resilient Pastures’ is a project funded by the Australian Government’s Future Drought Fund Drought Resilient Soils and Landscapes Grants Program, secured by Southern NSW Drought Resilience Adoption and Innovation Hub. The project is led by Holbrook Landcare Network and partners include Central West farming Systems, Monaro Farming Systems, Riverine Plains, FarmLink, Local Land Services, NSW DPI, CSU and The Southern NSW Resilience, Adoption and Innovation Hub, with a project period of June 2022 – June 2024.

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