

MASTER — Experimental design

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Field day at the MASTER site

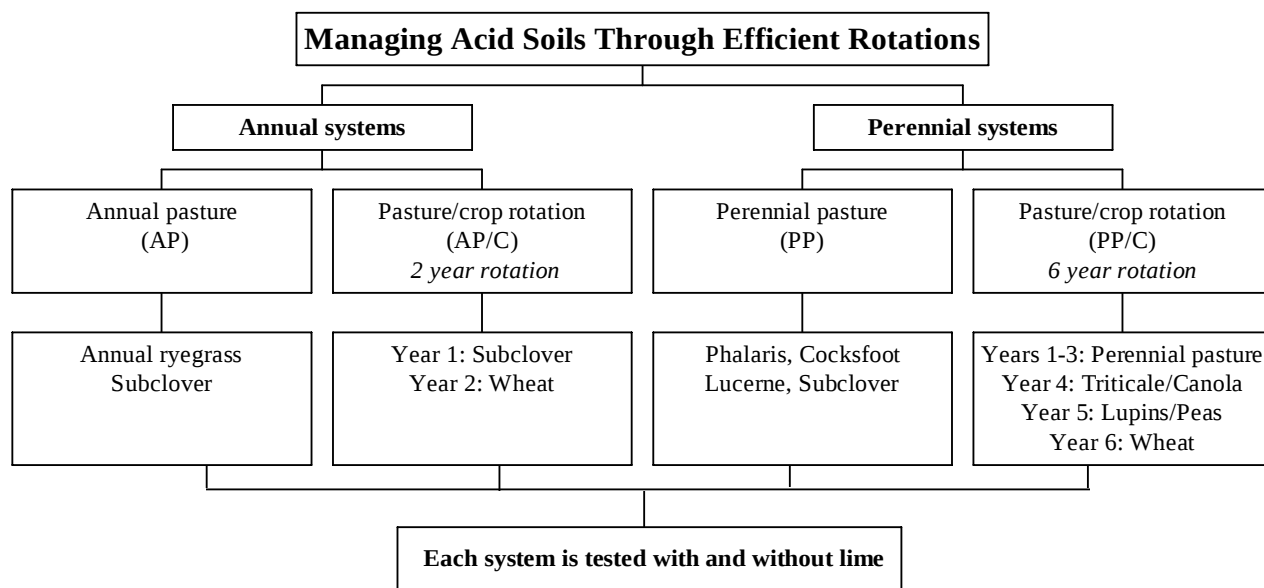
Summary

A series of Primefacts was produced to report the results of MASTER — Managing Acid Soils Through Efficient Rotations. This Primefact outlines the experimental design, treatments, lime regime and measurements.

experiment that commenced in 1992. It was designed to develop and demonstrate a sustainable agricultural system that is economically viable and environmentally effective to manage the highly acid soils in the high rainfall region (550–800 mm) of south-eastern Australia.

Introduction

Managing Acid Soils Through Efficient Rotations, known as MASTER, is a long-term agronomic



The experimental site is located on a farm property 'Brooklyn', operated by the Hurstmead Pastoral Company Pty Ltd, at Book Book, 40 km south-east of Wagga Wagga. The average annual rainfall was 614 mm. Soil type is yellow podzolic (subnatric Yellow Sodosol), with some red phases over the site. The initial pH was around 4.1 at 0–10 cm depth, and subsoil below 20 cm was also highly acidic.

Objectives

- To test whether perennial systems are less acidifying than annual systems.
- To ameliorate subsoil acidity by topdressing lime.
- To demonstrate the crop, pasture and animal responses to lime.
- To assess the economics of lime use.

Experimental design

There are 80 plots of size 45 m × 30 m, with 10 m laneways. The underlying treatment comparisons are as follows:

- Annual pastures versus perennial pastures.
- Annual pasture / cropping rotations versus perennial pasture / cropping rotations.
- Limed versus unlimed treatments.

Basal fertilisers

- Superphosphate at 15 kg P/ha each year.
- Molybdenum at 50 g Mo/ha every 5 years.
- Potassium at 25 kg K/ha each year.

Lime application

- **Initial lime rate:** 3.7 t/ha, incorporated into top 10 cm soil in 1992.
- **Maintenance lime rate:** 1.6–1.8 t/ha top-dressed every 6 years.

Key measurements

- **Surface soil samples:** pH, Al and Mn in 0.01 M CaCl₂, total N, Colwell P, organic carbon, and exchangeable Al, Ca, Mg, Mn, K and Na at 0–10, 10–15 and 15–20 cm.
- **Deep soil cores:** pH, exchangeable Al, Ca, Mg, Mn, K and Na at 0–10, 10–20, 20–30, 30–40, 40–50, 50–60, 60–80, 80–100, 100–120 cm.
- **Crop data:** establishment counts, anthesis and harvest dry matter, grain yields.
- **Pasture yield:** pre- and post-grazing DM, botanical composition.
- **Livestock:** stocking rate, liveweight, wool production.

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- Commercial sponsors: Incitec-Pivot Pty Ltd (Fertilisers) and Omya Australia Pty Ltd (Lime) since 1992.

Further information

- Li, GD, Helyar, KR, Conyers, MK, Cullis, BR, Cregan, PD, Fisher, RP, Castleman, LJC, Poile, GJ, Evans, CM and Braysher, B 2001, 'Crop responses to lime in long term pasture/crop rotations in a high rainfall area in south-eastern Australia', *Australian Journal of Agricultural Research* 52, 329–341.
- [Primefact 32, MASTER — Soil acidity and lime responses](#)
- [Primefact 33, MASTER — Crop responses to lime](#)
- [Primefact 34, MASTER — Pasture responses to lime](#)
- [Primefact 35, MASTER — Sheep responses to limed pastures](#)
- [Primefact 36, MASTER — Nitrate leaching and deep drainage on acid soils](#)
- [Primefact 37, MASTER — Earthworm numbers and microbial carbon concentration](#)
- [Primefact 38, MASTER — Economic analysis](#)

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