Distribution of phosphorus levels across the Healthy Soils for Healthy Landscapes and Benchmarking Soil Chemistry projects areas for cropping and pasture systems.

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Introduction

The Healthy Soils, Healthy Landscapes (HSHL) and Benchmarking Soil Chemistry (BSC) projects are funded by the Australian Government through National Heritage Trust (NHT-II) and National Action Plan (NAP) funding initiatives in conjunction with the NSW Government and the Murray, Murrumbidgee and Lachlan Catchment Management Authorities (CMAs) and Environment ACT. These projects are a key part of the investment in improved natural resource management through the improvement of landholders and land managers soil knowledge and practices. The projects have been running for 12 months and has a further two years remaining.

Soil collected as part of these projects undergoes analysis for a wide range of essential plant nutrients, the focus of this paper however will concentrate the soil available phosphorus (P) results collected to date. P plays an important role in the farming systems across the project area and is an essential element for plant and animal growth. Many soils in Australia are P deficient in their undeveloped state, so the use of P fertiliser is necessary for profitable agricultural production. There are many laboratory methods used to determine the available P levels in the soil. It is important that producers and advisors are aware of the method used to determine the P level of their sample as the value used to determine adequate/inadequate nutrient levels varies between methods used. In these projects the Colwell P method is used and critical values reported here refer to this method only.

The project is delivered by NSW Department of Primary Industries (NSW DPI) to small farmer groups as a four workshop series. An important feature of the project is the use of the farmer's own soil tests and local trial data when interpreting soil test results. Participants gain a better understanding of the physical and chemical properties of soils, plant nutrition, soil health problems and how these may limit production.

Analysis of soil P levels collected as part of these projects displays a wide range of available P levels. Alarmingly a large proportion appear to be under critical Colwell P levels, while there are another group of paddocks well in excess of critical Colwell P levels.

Methods

Soil samples are collected by workshop participants as part of the workshop series and the soil samples are tested by Nutrient Advantage Laboratory Services. GPS readings are taken for each paddock soil tested for future soil mapping across the different catchments and entered into a database managed by NSW DPI. Soil is collected from two depths at each site (0–10 cm and 10–20 cm).

Results and discussion

The results for the projects have been split into two systems – cropping and pasture and the P levels into six categories which range from low to very high (0–10, 10–25, 25–35, 35–45, 45–70, >70 mg/kg) (Figure 1 and 2). As a general rule, cropping paddocks with a Colwell P less than 25 mg/kg will not have adequate available P to obtain maximum production. Producers should aim to have a Colwell P above 35 mg/kg in cropping paddocks so that P will not limit yield potential. Productivity of pasture paddocks may be limited when available P falls below 25 mg/kg. Native pastures, however, tend to be more tolerant of lower P levels than those dominated by introduced species. For pastures with a high proportion of introduced species, producers should aim to maintain available P levels above 25 mg/kg for high production and persistence. Another important consideration for producers needing to change their available P levels is the phosphorus buffering index (PBI) of their soils. Soils with a low PBI can more easily have available P levels increased through addition of P fertiliser. Soils with a high PBI require higher levels of P application

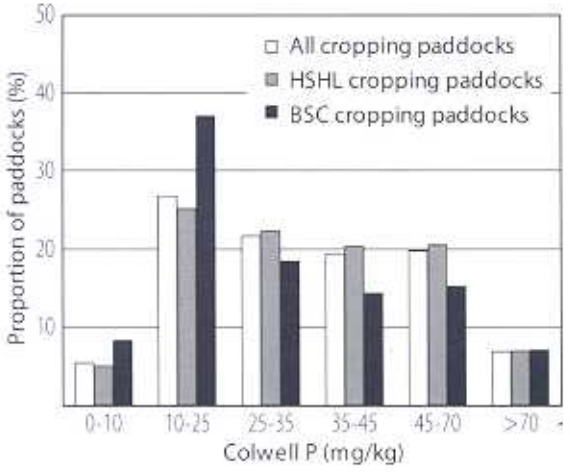

Figure 1 Colwell phosphorus for cropping paddocks (0–10 cm).

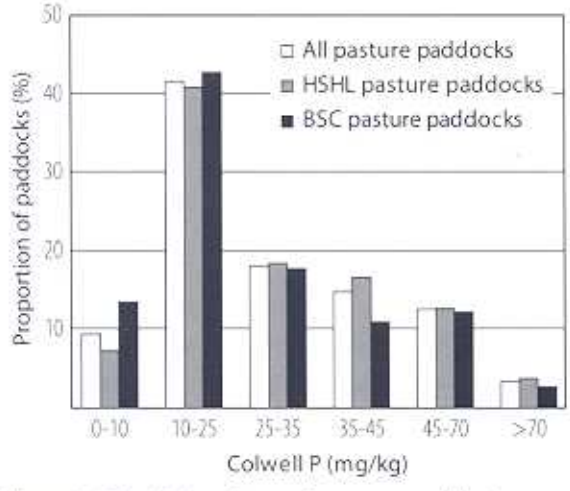

Figure 2 Colwell phosphorus for pasture paddocks (0–10 cm).

to increase available P levels. Generally, as soils become more heavily textured (those with a high clay content) their PBI increases and therefore the amount of fertiliser required to increase P availability also increases. As a guide, a low PBI is generally <140, medium 141-280 and high>281.

A total of 3045 paddocks have had soil samples taken at the two depths by 717 landholders across the two project areas from August 2005 to April 2006. What follows is a small snapshot of the data that has been collected. The number of paddocks tested for the cropping system was 1658 and for the pasture system was 1387.

- 51% of the paddocks for the pasture systems that were soil sampled were below 25 mg/kg Colwell P, the soil benchmark level considered marginal for native pastures and improved tableland pastures with very low phosphorus buffering index (PBI).
- 32% of cropping system paddocks that were soil sampled were below 25 mg/kg Colwell P;
- 46% of the paddocks for the cropping systems sampled were above 35 mg/kg Colwell P, the soil benchmark level considered adequate for cropping in Southern NSW for soils with a very low to low PBI.
- 31% of the pasture systems paddocks sampled were above 35 mg/kg Colwell.
- 27% of cropping paddocks were above 45 mg/kg Colwell P (very high) as compared to 16% of paddocks soil sampled for the pasture systems.

Soil test results across the project area show that paddocks in cropping systems have greater proportion of Colwell P levels in the medium to very high ranges. Discussions with producers who have soil with high P levels indicate that they have not been actively managing P levels during the cropping phase and recognise the need to refine their current strategies.

An opportunity exists for landholders with high to very high levels of P to reduce fertiliser P inputs so as to use this soil P resource. This will allow these producers to target paddocks with lower P levels and increase productivity in those areas. Alternatively, the cropping phase may be more effectively used to build up soil phosphorus reserves when cropping returns are relatively high to then be drawn down during the pasture phase during periods of low livestock returns. More research is required to evaluate such strategies.

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