

Diagnosing nutritional constraints in sandy soils

TAKEAWAYS

- **Nutrient supply is a common and important limitation to crop production in sandy soils.**
- **Understanding the extent and severity of nutrient constraints is the first step in working out which nutrients need to be added.**

THE ROLE OF NUTRITION FOR CROPS ON SANDY SOILS

Sandy soils are often nutrient deficient or infertile because they are highly weathered soils which are low in carbon and have a poor ability to retain and cycle nutrients. The realisation of the crop yield potential generated by amelioration of sands relies on adequate crop nutrition to feed the new yield potential. There are some key considerations when assessing nutrient status:

- **WHAT ARE THE LIMITING NUTRIENTS?** The most common limiting nutrient in sandy soils is nitrogen (N) but there can also be deficiencies of phosphorus (P), potassium (K), sulfur (S), zinc (Zn), copper (Cu), manganese (Mn) and molybdenum (Mo). The methods available to identify which nutrients are limiting include soil and plant testing and in-crop test strips where fertilisers containing target nutrients are applied to check which nutrients the crop will respond to.
- **WHERE DO THE CONSTRAINTS EXIST ACROSS THE Paddock?** How do constraints differ in paddocks between the soil types (e.g., dunes, mid-slopes and flats) or production zones? Collect soil samples from strategic diagnostic zones for the 0-10 cm layer depth and send to an accredited laboratory for analysis.
- **HOW SEVERE IS THE CONSTRAINT?** Is the constraint marginal or deficient and therefore production limiting? See Table 1 for a generalised guide of soil test thresholds for sandy soils. Use these diagnostic criteria to assess the severity of nutritional constraints and assign a Sandbox Rank for each paddock diagnostic zone.

Table 1. Severity of nutrient limitations based on critical values for laboratory soil tests for nitrogen, phosphorus, sulfur, potassium, zinc and copper.

Sandbox Rank	NUTRITION ¹	
0	Sufficient	N > 40 kg/t target yield, P > 18 mg/kg Colwell P, S > 4.1 KCl-S, K > 49 mg/kg Colwell K, Zn > 0.27 DTPA Zn and Cu > 0.23 mg/kg DTPA.
1	Marginal	N 20- 40 kg/t target yield, P 13-18 mg/kg Colwell P, S 2.2-4.1 mg/kg KCl-S, K 30-49 mg/kg Colwell K, Zn 0.12-0.27 mg/kg DTPA and Cu 0.15-0.23 mg/kg DTPA.
2	Deficient	N < 20 kg/t target yield, P < 13 mg/kg Colwell P, S < 2.2 mg/kg KCl-S, K < 30 mg/kg Colwell K, Zn < 0.12 DTPA and Cu < 0.15 mg/kg DTPA.

¹Soil test thresholds for N, P, K, S are derived from <https://bfdc.com.au/interrogator/frontpage.vm> and for Zn and Cu from Peverill et al. (1999) Methods of soil analysis – an interpretation manual. Note that soil testing for manganese and molybdenum availability do not have reliable thresholds.

USEFUL RESOURCES

Soil testing for crop nutrition

https://grdc.com.au/~media/documents/resources/publications/fact-sheets/grdc_fs_soil-testing-for-crop-nutrition-s_low-res-pdf.pdf

Soil and plant testing for profitable fertiliser use

https://www.agronomysolutions.com.au/wp-content/uploads/2020/05/AGRGRD-Soil-and-Planning-Back-Pocket-Booklet_FA_online_HR.pdf