DECISION KEY TO ASSESS SUITABILITY OF COMMON SOIL AMENDMENTS

Soil amendments are applied to alleviate production problems caused by soil acidity and poor soil structure. Lime, gypsum and, to a lesser extent, dolomite are the most common soil amendments but there is often confusion over which amendment is the most appropriate for any given situation. This decision key clarifies where the common soil amendments are appropriate.

The focus of the decision key is on reducing soil acidity and improving soil structure through the use of soil amendments. Plant nutrients, namely sulfur, calcium and magnesium, can also be applied depending upon which soil amendment is used. Yield and profitable responses to sulfur occur where sulfur levels in the soil are inadequate for plant growth, but for calcium and magnesium there is currently no evidence of biological yield advantage or economic benefits from their application to broadacre crops and pastures. While calcium and magnesium may become limiting nutrients for plants in the longer term, it would be drastic and perhaps costly to focus on them at the expense of other nutrients that are known to be required by plants and have economic benefits in the immediate to short-term.

Similarly in Australian soils under Australian climatic condition there is currently no rigorous scientifically verifiable evidence that manipulating the ratios of cations like calcium and magnesium directly or reliably improves yield or quality of crops and pastures. It is well documented however that improving soil physical condition by increasing soil calcium can interact with other nutrients to enhance and sometimes diminish responsiveness. Although extremes of high and low ratios can impact on plant uptake of nutrients such as calcium and magnesium, the impact is secondary compared to available nutrient concentrations.

For simplicity this decision tree focuses on topsoils. It is equally applicable for determining soil amendments for subsoils, although in most cases topsoil problems need to be addressed first. Soil amendment and management options for various combinations of topsoil and subsoil issues are considered very well elsewhere (e.g. Australian Soil Fertility Manual p. 20, Better Soils Mean Better Business, p. 16) based on similar underlying principles as those used in this decision tree.

The decision key is consistent with surface soils with a texture of clayey sand or lighter having insufficient clay to be susceptible to poor soil structure (Needham et al, 1998).

Other factors to be considered when using the decision key are:
- higher salt content of the soil (commonly measured as electrical conductivity) can improve soil structure if soil structure is poor and soil texture is heavier than clayey sand (see NutriFact CAS/02). An increase in ionic strength of the soil solution or the “electrolyte effect” from application of gypsum is a common example
- application of gypsum doesn’t necessarily improve soils (heavier than clayey sand) with poor structure because many factors influence soil structure (see NutriFact CAS/02). Laboratory tests should be conducted to determine if gypsum is required, and if so, to approximate the rate required.
- Required rates of lime can be calculated from soil pH and the buffering capacity of the soil which is commonly and easily estimated from soil texture.
- Higher soil organic matter content can help improve structure of all soils.

References


Do a dispersion test and laboratory measurements indicate soluble calcium can improve soil structure?

Is soil pH_{CaCl2} < 5.0?

Yes

Is the soil texture clayey sand or lighter?

Yes

Lime

No

No soil amendment

No

Is the soil texture clayey sand or lighter?

Yes

No

Does soil have poor infiltration, high run-off, poor workability, poor trafficability, surface crusting or a hardsetting surface?

Yes

Lime

No

No soil amendment

No

Is the soil texture clayey sand or lighter?

Yes

No

Does soil have poor infiltration, high run-off, poor workability, poor trafficability, surface crusting or a hardsetting surface?

Yes

Lime

No

No soil amendment

No

Does soil have poor infiltration, high run-off, poor workability, poor trafficability, surface crusting or a hardsetting surface?

Yes

Lime

No

No soil amendment

No

Does soil have poor infiltration, high run-off, poor workability, poor trafficability, surface crusting or a hardsetting surface?

Yes

Gypsum

No

No soil amendment

No soil amendment

Maybe some soil structure benefit from gypsum in addition to lime

Phone: 07 3220 2959 • Email: info@backpaddock.com.au • Web: www.backpaddock.com.au