LIMING

STEP UP SOILS

Early warning signs of soil acidity are not easily identifiable and diagnosis requires regular monitoring of soil and plant tissue.

Introduction

Agricultural production, especially intensive horticulture generates the potential for acidification of soil. Many regions require liming to put back the alkalinity lost via harvested products and leaching of ammonium derived nitrate, as many soils do not have the buffering capacity to continually "absorb" the excess acidity, and will acidify over time. This is evident by the extent of acidification across Australian soils and recognition that acidification is a major threat to long term production and natural resource sustainability. Good land management can slow down the rate of acidification, but may not stop soil becoming acidic.

Most land owners have access to sources of lime, however the quality of products vary. The requirements for liming are also site specific and will also depend on the use of the land. There is no "general rule of thumb" for liming. Rather land owners need to consider the following four factors to determine their lime requirements.

Step 1: Is liming required?

If present, the following factors have the potential to affect yield and product quality hence economic return, and may limit future options for land use.

1. Soil pH within the active root zone below, or trending towards being below the optimal pH range for major crops grown;
2. Plant tissue analysis indicating imbalances of nutrients associated with higher soil acidity;
3. Subsoil at risk of acidification or beginning to acidify;
4. High acidity putting the soil itself at risk of structural decline, loss of organic matter, or loss of biological activity.

If soil and plant data do not indicate the need to lime, then there is little to be gained by applying lime.

Step 2: Do you understand the buffering capacity of your soil?

Buffering capacity is the ability of soil to resist change in pH. Buffering capacity is dependent on a number of soil properties.

Soil with higher buffering capacity: will take longer to acidify, but require more lime to raise the pH. Providing that land managers are aware of the above, soil with higher buffering capacity provide more options in how often, and how much lime to apply, and in "buying time" during circumstances that may limit the capacity to apply lime. However the soil and crop types grown may not show improvements to liming over the short term, particularly when liming to raise pH by larger values, and when starting at higher pH. Clays and loam with higher soil organic carbon, and containing types of clay minerals that generate more negative charge, will have higher buffering capacity.

Soil with low buffering capacity: Sand with low organic carbon, and soil containing clay minerals that only generate small amount of negative charge, will have lower or little buffering capacity. Annual liming programs may be required. Variable responses can be linked to over applying lime which can lock up some of the essential plant nutrients that are normally only present within the root zone in small amounts.

If soil requires liming, a sample should be sent off to the laboratory to enable the buffering capacity to be calculated. The cost of the test is easily returned through better choice and more efficient use of lime products.

Step 3: Which type of lime to use

Liming materials have varying neutralizing strengths due to differences in chemical composition and purity. Lime is generally mined from local sources and without blending may vary considerably between batches. The composition and neutralizing strength of the liming material of each shipment must be known to determine how much to add to the soil to reach a target pH, and whether impurities do not create their own problems.

Step 4: What grade of lime to use

Lime must react with soil water to release the neutralising agent however lime is not readily soluble in water. Grinding lime to smaller particles will generate more surface area allowing more rapid dissolution in water. Thus lime products are available in varying size grades that have varying levels of neutralizing activity. Finer grades of lime have more activity and should raise soil pH more quickly. However finer grades of lime are more expensive and problematic to apply under windy conditions. Coarse grades of lime may not react within timelines required. Blends of varying grades often provide the best solution for short term gain and longer term maintenance of soil pH.

Be clear on what you are trying to achieve by liming: target soil pH, crop productivity outcomes, soil properties outcomes, timeline, and budget.

Step 5: Evaluate

Suppliers of lime products can provide information on the purity and grade of their products, and be able to calculate requirements for different soil buffering capacity and pH targets.

Agronomists can verify liming requirements and identify application strategies for crop types grown, which may include varying fertiliser use, when to apply lime in the crop rotation cycle, and rates.

Further reading:

Farming systems and soil acidity, Primary Industries and Resources SA, Fact Sheet 510

Suppliers:

Google: "Suppliers of lime in insert your local region"

Agronomists

Australian Society of Agronomy: http://www.agronomy.org.au/

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