

SOIL PH AND THE USE OF LIME

by Mike White, May 2005
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Soil acidity refers to the concentration of H⁺ ions in the soil. This is represented on a pH scale of 1-14 with pH 1 being strongly acidic, pH 7 neutral and pH 14 strongly alkaline. Most New Zealand soils have natural pH values between pH 4.5 to 7.0.

Over time the soil pH will decrease (become more acidic) due to plant growth, organic matter mineralization, nitrate leaching and the acidifying effect of some fertilisers (the fertiliser effect is relatively minor when compared to the soil acid generated by the soil-plant environment).

For optimum production and quality the target soil pH for arable crops generally lies between values of pH 5.8-6.5, depending on the crop. Agricultural lime, which consists of calcium carbonate (CaCO₃) is generally used to correct soil pH in acidic soils or to maintain the soils current pH status. Lime neutralises soil acidity by the carbonate in lime reacting with the acidic hydrogen ions (H⁺) in the soil to ultimately form water and carbon dioxide. Other liming agents include dolomite, burnt and slaked lime and industrial by-products usually containing calcium oxide/hydroxide).

The benefits of liming soils include:

- increased mineralisation
- supplying calcium
- increased molybdenum availability
- increased phosphate availability (limited to some specific soils)
- decreased aluminium and manganese toxicity and,
- increased soil water holding capacity.

However care should be taken not to over lime as this can reduce availability of trace elements (such as zinc and manganese) and the use of lime can also reduce the plant availability of rock phosphate where this is part of the fertiliser programme.

Generally for crops it is economic to apply lime to achieve the target soil pH values. Agricultural lime does take time to dissolve in the soil so it is essential to plan lime applications 3 to 6 months in advance of planting the crop. Good quality lime should have a calcium carbonate content of 80% or better and a particle size distribution where at least 50% of the lime passes through a 2mm sieve. For best results lime should be incorporated into the soil. As a general guide to liming quantities, 1 tonne of good quality limestone raises soil pH by 0.1 units for the top 15cm of the soil. However, this relationship varies depending on soil type and recommendations should be altered to take this into account.

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