WARNING!

ACID SOILS COST THE EARTH!

Soil acidity causes farmers to lose production, profitability and return on input investments in their farms. The problem can be severe if left untreated, but can be treated effectively by applying lime.

THE NATURE OF SOIL ACIDITY

Soil acidification is a natural phenomenon and is also an inevitable consequence of productive farming systems. The major causes are:

- removal of farm produce
- use of ammonium based fertilisers
- nitrogen fixation by legumes
- leaching of nitrate and other nutrients
- accumulation of organic matter

Soil acidification occurs slowly but gradually reduces farm productivity without obvious signs of decline. If left untreated it will result in massive production loss from which it takes a long time to recover and at high cost.

Factors that accelerate acidity in farming systems include:

High rainfall (>450 mm)	• Promotes leaching. • Active soil microbes turning over organic matter.
Light texture soils	• Easily leached, low resistance to pH change.
Legumes in rotations	• Nitrogen fixation. • Leaching of nitrate.
Use of ammonium fertilisers	• Conversion of ammonium to nitrate acidifies.
Annual pasture systems	• Nitrate is leached as residues break down. • Organic matter accumulates increasing soil acidity.
High product removal	• Alkalinity in plant products are removed from the farming system, leaving the soil more acid.

As soils acidify, there are fewer choices of crops and pastures that will grow productively. Soil health declines, activity of nitrogen fixing bacteria declines and nutrient imbalances emerge.

Soils become dangerously acid for crops when pH_{Ca} falls below 5.5 for cropping and below 5.0 for pastures.

Soil acidity develops from the surface down. It is usually most severe in the top 20-30 cm. This means that shallow-rooted plants such as peas, lentils and pasture legumes are often most susceptible. Cereal seedlings are also susceptible as roots grow through the acid zone.

THE COSTS OF SOIL ACIDITY

Left untreated, the cost of soil acidity gets higher until soil may become permanently unsuitable for production. Some elements of costs are outlined below.

Element of cost	Key points
Lower productivity and profit	Indicative % potential yield losses are: Broadacre: cereals 40, oilseeds 65, pulses 50, pastures 30. Horticulture: vegetables 45, trees 25, vines 25. Yield loss varies depending on severity of acidity and tolerance of plant variety. Input expenditure remains but returns are much lower. Total yield loss occurs when chosen plants reach the limit of their tolerance.
Reduced options	The more severe soil acidity, the fewer agricultural plants will grow. Lucerne and canola are sensitive to acidity.
Permanent land degradation	In strongly acid soils (pH_{Ca}<4.5), clay minerals breakdown leading to chemical erosion, reduced nutrient retention and lower water holding capacity. This is irreversible.
Lower property value	Value of properties known to be unproductive due to soil acidity can be discounted by 15-20%.
Loss of rural communities	Regional and local rural economies are affected when collective productive capacity is reduced by soil acidification.

THE BENEFITS FROM LIMING

Preventative liming is fundamental to management of soil acidity to avoid these costs.

Acid soils can also be rehabilitated with lime although the more acid the soil, the longer it can take. The most common application rate is 2.5 t lime/ha.

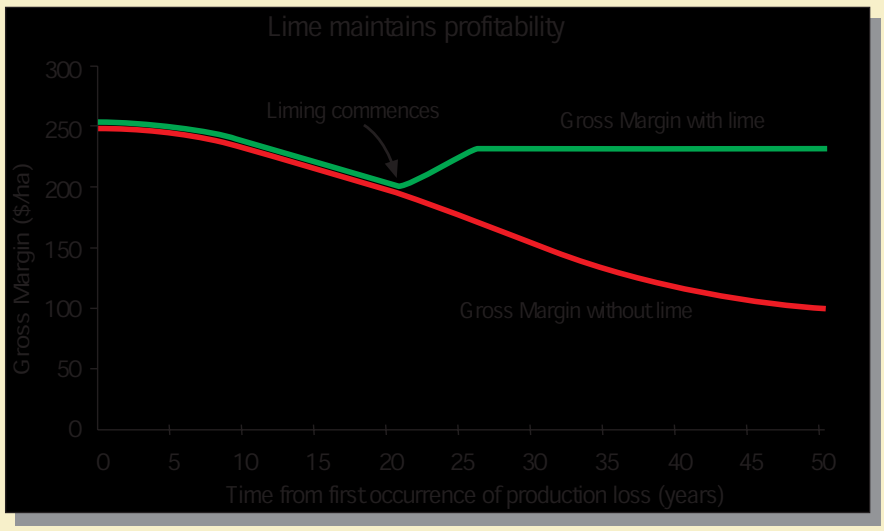
Element of Benefit	Key Points
Productivity boost	• Yield responses of >100% in acid sensitive plants have been recorded. • Lime benefits are cumulative – 2-3 applications a few years apart may be necessary
Better livestock health	• Improved calcium and magnesium intakes enhance livestock health.
Favourable benefit:cost ratio	• In cropping systems, benefits of more than $3 for each $1 invested are common. For grazing the benefit:cost is usually more than 2:1. • Yield increases of only 1-4% can make liming pay.
Residual benefit	• Benefits from lime applications last for 5-10 years once optimum pH levels have been restored.
Farm return on investment	• Returning soils to optimum pH helps maximize the return on investment in all farm inputs. • Liming acid soils improves availability of phosphorus fertilizers

THE COSTS OF LIMING

The cost of lime varies with its quality and transport and spreading charges. Lime suppliers can provide quotations. Lime costs are minimised if it is applied regularly to prevent acidification.

ACID SOILS MUST BE LIMED – *Lime it or lose it!*

Lime is a valuable investment in the farm business. The risk of not getting a return on investment in lime is small. Strategic liming based on a soil pH-monitoring program is an essential component of farm management practice in areas at risk from soil acidification.



In this example gross margin has halved over 30 years without lime. Over 50 years there will be a cumulative loss of $2300/ha or $0.46million for a 200 ha property. Liming to prevent soil acidification will prevent this loss and also underpin increases in productivity and profit for the property.

LIMING FOR THE FUTURE

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