

tillage

Benefits of liming? Ask our ancestors

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Dotted around the Irish landscape are the remains of old lime kilns, many dating from the 18th century. These were used to burn limestone rock at high temperatures to produce lime dust. Farmers of the time recognised that spreading the lime dust improved soil productivity, boosting grass and crop growth. Lime kilns were seen as indicators of farming prosperity, and most villages had at least one lime kiln.

The wisdom of our ancestors is lost on many of us today and lime is often the forgotten fertiliser when it comes to growing tillage or grass crops. The level of lime application to Irish soils has decreased dramatically over the past 40 years. There was twice as much lime spread in 1977 as there was in 2015. Ongoing analysis of soil sample trends by Teagasc shows that 55% of tillage and 65% of grassland soils are still below the optimum soil pH.

What does lime do?

Lime is a natural soil conditioner which corrects soil acidity. Most Irish soils are naturally acidic, but there are a few exceptions (see farmer profile). Improving soil pH allows soil biological organisms and earthworms to thrive, breaking down plant residues, manures and facilitating the efficient release of soil nutrients.

Excessively low (or indeed excessively high) pH has the effect of locking-up nutrients in the soil (most notably soil phosphorus). Correcting soil pH can improve the availability to plants of nitrogen, phosphorus, potassium and sulphur, as well as many of the trace elements.

Lime also has beneficial effects on soil structure, particularly in heavy soils, helping to improve soil drainage and making it easier to prepare a fine seedbed for crop establishment.

How is lime lost from soils?

There are three major processes by which lime is lost from soils. In order of importance: lime is lost through leaching, high nitrogen usage and crop removal or harvesting. Leaching losses can vary from 250kg to 625kg per ha per year, depending on rainfall levels.

Nitrogen is a major and essential driver of crop yield but lime is required to neutralise acidity produced by nitrogen fertiliser. Estimates are that 180kg to 220kg per ha per year of lime is required to neutralise 100kg of nitrogen as CAN or urea fertiliser. Harvested crops remove approximately 15kg/t of lime per tonne of dry matter removed. Growing spring barley for three years in the field will deplete up to one ton of lime per acre, as outlined in Table 1.

Soil pH and lime requirements

January is the ideal month to check soil fertility status and determine the amount of lime required to deliver



optimum crop growth.

Aim to maintain soils growing tillage crops at a pH of between 6.5 and 7.0. In general, heavy soils will tend to have a higher lime requirement than lighter soils. Lime advice is reported in tonnes per ha on the soil analysis report.

There are some quick soil test kits available, such as handheld pH meters, but a full soil test is the best and most accurate indication of soil lime requirement.

Apply lime as recommended on the soil test report. Check the lime requirement every three to five years.

Soil pH and tillage crops

As well as recognising the benefits of lime, our ancestors also knew how to

Table 1

Lime depletion and growing a spring barley crop	kg/ha removed
Grain and straw removed = 8t DM at 15kg /t DM	120
Leaching and drainage losses (estimate)	500
Lime used to neutralise applied N	270
Total lime depletion per ha	890kg/year
Total lime depletion per acre	360kg/year

Three years of growing spring barley can deplete up to 1,000kg or 1t of lime per acre (1,000kg). Assumptions: Grain yield = 7t DM/ha. Straw yield 1t DM/ha. 135kg N/ha applied to grow the spring barley crop.

Table 2: Optimum soil pH for a range of crops on mineral soils

Crop	Optimum soil pH
Beet, beans, peas and oilseeds	7.0
Cereals and maize	6.5
Potatoes	6.0
Peaty soils	5.8

FARMER PROFILE AIDAN WALSH

Aidan is a specialist tillage farmer and agricultural contractor based in Durrow, near Tullamore, Co Offaly. Aidan has experience in growing a range of crops including winter and spring cereals, spring beans, fodder beet, oilseed rape and linseed. He places strong emphasis on the importance of testing soil and getting the pH right to grow a successful crop. "In my experience, beet and barley are the most sensitive of all the crops to low pH, and I have seen crops fail where low pH was not corrected," says Aidan. "If we take new land we will always do soil tests."

Aidan's preferred method of liming tillage soils is to apply lime to the stubble in autumn, followed by a run of a heavy grubber. He leaves the soil until the following spring before ploughing and sowing the crop. This takes a certain amount of planning he acknowledges, so having a three- to five-year liming plan for the farm is important.

While Aidan is a strong advocate of spreading lime, ironically the soils on his home farm are naturally high in pH, with typical readings of pH 7.1 to 7.8 being reported on soil test results. "We never have to spread lime here on this farm in Durrow," Aidan explains. He feels that the close proximity to the Eiscirs (ridges of sand deposited during the ice age) is probably the cause of this effect on soil pH. However, once you leave this immediate area, Aidan notes, the soil pH changes dramatically. "Our rented land receives lime on a regular basis."

Crop margins are tight, Aidan concludes, but lime is still good value for money. Get your land tested and spread lime if required; your crop won't yield without it.



match crops with soil type. Peaty soils (generally a pH 5.5 to 5.8) are common in the midlands, and past generations successfully grew crops of oats and potatoes in these black soils, where they knew barley crops would fail.

Table 2 outlines the optimum soil pH for a range of tillage crops. Barley is the most sensitive of the cereal crops to soil acidity.

Wheat is more tolerant, but it is desirable to maintain a pH of 6.5 to avoid yield penalties. Beet, oilseeds and the protein crops (beans, peas) require high soil pH 6.8 to 7.0 and are sensitive to lime deficiency. Crop failure can result where liming is overlooked.

ABOVE: Aidan Walsh and Paul Fox.

Lime – a great investment

Teagasc research shows that maintaining mineral soils at a pH of 6.5 can increase grain yield by up to 1.5t/ha. Taking current grain price and an annual lime maintenance cost into account, this represents a return of almost €7 in additional grain sales for each €1 invested in lime, or a 7:1 return on investment (grain: €225/ha, lime: €33/ha). Just ask our ancestors – applying lime always made complete sense.

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