

Precision lime making a difference

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Teagasc tillage advisor

Bertie Ennis, his son Paul, and nephew Martin are tillage farmers, just outside Naul, north county Dublin. The business consists of 430ha, of which 350ha is tillage, growing both winter and spring crops and 80ha of grassland for hay and silage. In July 2016, Martin and Paul decided to try out precision soil sampling.

"We chose a block of 28.9ha which has been in continuous winter wheat for the last 25 years," explains Martin. "We could see a picture developing on the ground and getting slightly worse year on year. The three fields aren't suitable for any other crop so we had to look at ways to identify stale parts in the field and find ways to improve the situation."

At Ennis Farms, all fields are soil-sampled every four years. The results are compared with those for the previous soil test results. This continuous wheat block was last sampled in 2011 where three soil samples showed soil pH levels ranging from 5.56 to 6.9 and lime recommendations from 2.5 to 7.5t/ha.

"It was clear that there was huge variation in pH and we wondered

whether this unusual situation might justify an even more tailored approach," says Martin. Paul and Martin started thinking about precision soil sampling and Bertie was happy to let them go ahead: "You have to try new things and not always do what you have always done. An experiment might backfire, of course, so we tried it at small-scale initially."

Ennis Farms went ahead with the precision soil sampling in September 2016 on the 28.9ha of continuous wheat ground. The block was mapped using GPS (Figure 1) and one soil sample was taken approximately every hectare, with 20 cores being taken per soil sample (Figure 2).

Paul describes the process: "It took around three hours for the soil samples to be taken; we didn't have to do anything just point out the block we wanted done." It took two weeks for Ennis farms to get the detailed results of the samples. Bertie says: "Every hectare was given an individual result and recommendation for lime, P and K."

On first glance at the soil sample results, the lads could immediately relate them to what they had observed in this block of three fields over the years. "You know all your ground inside out, you walk and drive through it a number of times a year and you can see where the crop is heavier and



where it's lighter," says Martin.

Having looked at where the high levels of lime were needed in the field; they agreed that these were the lighter yielding parts of the field.

They decided to act on the precision soil sample results for lime only last year and to look after P and K as they always have. They got in a contractor to spread the lime on top of the ploughed ground.

They gave him the map of results showing how many tonnes were needed on each hectare, the contractor was then able to follow the map and shut on and off the spreader accordingly, costing Ennis farms €25/t

Figure 1: Continuous wheat ground

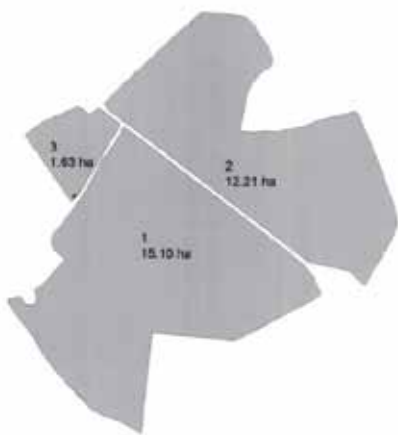
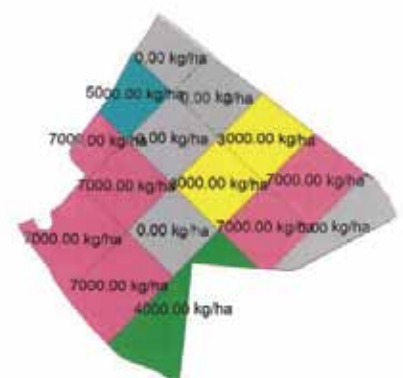


Figure 2: Where the precision soil samples were taken (28 samples)



Figure 3: Lime recommendations mapped for 15.1ha block





Eilish Burke and Martin Ennis.

Optimum pH levels

Soil samples analysed by Teagasc in 2016 show that approximately 63% of grassland and 47% tillage soil samples are below the optimum soil pH levels and need lime.

Target soil pH levels for tillage crop
Every crop is different and therefore requires different target soil pH levels for optimum growth and to achieve high yield production. The target soil pH for a number of common tillage crops are shown in Table 1.

Table 1: Optimum soil pH for a range of tillage 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	5.5 to 5.8

Benefits of liming

Soil pH has a significant bearing on the soil nutrient availability, unlocking soil phosphorus (P) and potassium (K). The goal is to maintain tillage soils in the optimum pH range (6.5 to 7.0) for sufficient uptake of soil nutrients and efficient use of applied nutrients during the growing season. Monitoring soil fertility through regular soil sampling is fundamental to either building or maintaining soil pH or P and K depending on soil test results.

Table 2 (below) shows the average levels of lime lost through drainage (rainfall), crop removals and N usage. Soil analysis will give reliable advice on the annual requirements for the soils on your farm as it will vary depending on soil type and annual rainfall.

Table 2: Average levels of lime lost through drainage (rainfall), crop removals and N usage

Lime removals per year	Kg/ha
Drainage (leaching)	250 – 625
Spring barley 7.0t/ha or winter wheat 10t/ha	105 – 150
150kg to 250kg nitrogen	300 – 500
Total lime required	655kg to 1,275kg/ha/yr

of lime spread verse €33/t to 35/t variable spread.

Ennis Farms were impressed by the results. “It’s a far more even crop across the board and what were the lighter yielding parts of the field are looking much heavier. The difference is unbelievable and that’s just from acting on the liming.”

Cost effectiveness

Before Ennis farms had done the precision soil sampling, they would have blank spread two tonnes of lime/ac:

- Soil sampling (one sample/8ha) = three samples x €25/sample = €75.
- 29ha = 71.51ac x 2 = 143t of lime needed.
- 143t x €25 spread = €3,575.
- €75 soil sampling + €3,575 liming and spreading = €3,650 total cost.

Precision soil sampling:

- Precision soil sampling (one sample/1ha) = 29 samples x €34/sample = €986.
- 103t of lime required x €25/t spread = €2,575.
- €986 soil sampling + €2,575 = €3,561 total cost.

Ennis Farms were apprehensive at first about precision soil sampling, however, to date the crop looks a lot more even and with better yield potential. The combine will tell the real story in terms of extra grain production and payback.

“ Precision liming is a very targeted approach but in most situations carefully taken soil samples every 2ha to 4ha will provide a sound basis to good lime advice for the soils on your farm. Where soils have not been sampled in the last five years consider taking soil samples over the coming weeks/months

– Mark Plunkett, Teagasc Johnstown Castle

Another block

Martin summarises: “We will precision soil sample another block of ground this year and hopefully continue doing so until all our own ground is done.”

They have not started variable rate spreading P and K due to spreading equipment availability and costs, plus there is not as much variability with soil P and K levels compared to the soil pH levels across fields tested to date. Nevertheless, a more targeted approach to P and K applications should offer further cost savings.