Have we turned the corner with national soil fertility?

TEAGASC soil sample reviews are showing positive indications of overall improvements in Irish soil fertility.

A review of soil sample results over 2017 and 2018 analysed by Teagasc indicates that soil fertility levels on Irish farms may be turning a corner, with some positive signs of overall improvement. Soil fertility had been in decline since the mid 2000s, linked closely with lower lime and compound fertiliser use, and had reached very low status between 2013 and 2015, with just 10% of soil samples showing good overall fertility in terms of pH (>6.2), phosphorus (P) and potassium (K) (≥ index 3) status. Over the last decade in particular, a worrying trend of continuous mining of the native fertility of some soils may have eroded their grass and crop production potential, limiting their ability to maximise grass as our main fodder source and to maximise the yield potential from new cereal varieties. The Teagasc soils database now indicates large improvements in soil pH levels and early signs of improvements in both soil P and K levels on farms, although the rates of these improvements are enterprise specific.

Soil pH

In 2017 and 2018, c.90,000 soil samples were analysed by Teagasc and this large database of soil analysis results has been shown to generally reflect national soil fertility trends. Over this period 49% of soil samples came from dairy farms, 44% from drystock farms and 7% from tillage farms. Notably, in 2018 the number of soil samples taken on dairy farms increased (by 29%) compared to the previous five-year average. Across all farm enterprises the only soil fertility indicator showing significant signs of improvement was soil pH (**Figure 1**). Increased research and advisory emphasis on the importance and benefits of lime application to our naturally acidic soils since 2013 has helped to raise awareness among farmers. This is reflected in current national lime use (approximately 1 million tonnes), which has increased by on average 211,000 tonnes per year since 2013 compared to the previous five years. The optimum soil pH for grassland mineral soils is ≥6.3 and in 2014-16, on average, 37% of soils tested were in this range. In 2017-18, an average of 54% of soils had optimum pH levels. When soils from tillage farms were examined separately, the improvements in soil pH were greater, with up to 83% of samples having optimum soil pH in 2017-18. This large improvement in soil pH will have significant positive effects on nutrient uptake efficiency from applied fertiliser and organic manures, and also on the longevity of reseeded grassland swards, in particular the maintenance of clover. Soil pH levels on dairy farms have shown improvement since 2015 and increased annual lime applications have contributed to a dramatic change in soil pH status over the last five years, with 64% of soils below optimum pH in 2014-15, and just 39% in 2017-18.

P and K levels

Examining soil P and K levels across all farming systems, just 38% and 45% of soil samples, respectively, had sufficient P and K for optimal grass and crop production (≥ index 3). The 2018 soil results show some positive signs, but a large proportion of soil samples still have low fertility (i.e., index 1 and 2), with 59% low in P and 50% low in K.

These data show very little difference between grassland enterprise (dairy vs drystock) in terms of soil P and K fertility levels, with 40% and 50% of soils with sufficient P and K (≥ index 3), respectively. Increased N-P-K compound fertiliser use on grassland farms over the last four to five years has not yet been reflected in soil P, which is naturally slow to respond; however, it appears that soil K levels are beginning to respond positively with a reduction of 10% in low K soils in 2018. This is a positive result, as it indicates a halt to the steady decline in soil K, some of which may have been a result of

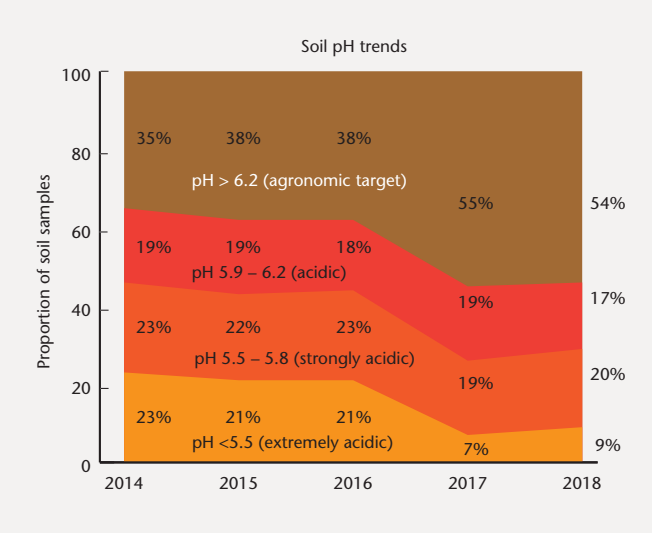

FIGURE 1: Proportion of soils analysed that fall into each soil pH range across all farm types. Based on a total of 223,000 soil samples analysed by Teagasc between 2014 and 2018.

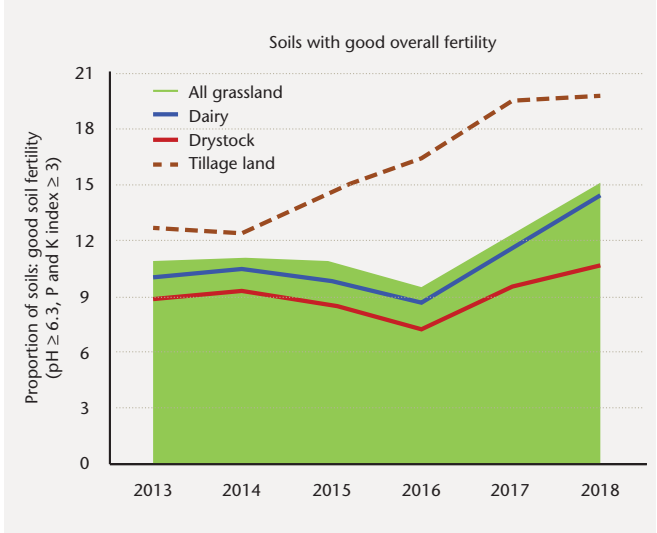

FIGURE 2: Proportion of soils analysed that had good overall soil fertility in terms of pH (≥6.3), P and K (index ≥3). Based on soil samples from grassland farms (240,000) and tillage farms (20,500) analysed by Teagasc between 2013 and 2018.

increased grass utilisation and the removal of high-quality baled silage from paddocks being routinely grazed. These paddocks need to have adequate K fertiliser returned to balance the high K offtake. The samples from tillage farms show a slow but steady improvement in both soil P and K levels over the past four years, with approximately 46% and 57% of soils with sufficient P and K for crop production (≥ index 3), respectively.

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Good progress

Overall, all farm enterprises have made progress in relation to soil fertility over the last couple of years (**Figure 2**). Soil fertility on tillage farms had the largest increase, with approximately 20% of soil samples with the optimum mix of pH, P and K for crop production. Dairy farms were next with approximately 15% of soils with good overall soil fertility. Drystock farms showed the least improvement, with just 11% of samples with good overall soil fertility. These poorer results on drystock farms may be influenced by a number of factors such as lack of profitability, lower fertiliser use, lower feed demand and need to maximise grass production, especially where stocking rates are low. While the majority of these overall soil fertility improvements have resulted from positive changes in soil pH across all farming enterprises, there are also indications that soil K, and possibly P, are also improving.

These positive trends in national soil fertility represent a foundation to build on. While they represent a snapshot at national scale, the real focus is needed at farm, and even field, scale to develop a balanced fertiliser programme and to utilise organic manure resources where they are most beneficial on low P and K soils. Soil fertility is a cornerstone of our grass-based animal production systems and critical for enhancing crop yields and quality into the future.

Authors

Mark Plunkett
Teagasc Crops, Environment and Land-Use Programme, Johnstown Castle, Co. Wexford
Correspondence: mark.plunkett@teagasc.ie

David Wall
Teagasc Crops, Environment, and Land-Use Programme, Johnstown Castle, Co. Wexford