

Fertiliser planning to improve grass production

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Summary

- Low soil fertility (e.g. P Index 1) equates to a loss more than 2.0 t grass DM/ha/year, which is worth €275/ha/year.
- Higher yielding swards require higher nutrient application rates to replace nutrients removed during grazing and silage cutting.
- Soil testing and fertiliser planning are key requirements for improving grass production.
- Slurry is a valuable resource. Target fields with highest requirement for P & K to help offset expensive fertiliser costs.

Introduction

Well-managed fertile soils are critical for profitable and sustainable grass based dairy systems. Soil quality is the term used to describe the soil's capacity to provide different functions such as grass production, water storage, nutrient recycling, soil organic matter (SOM) build-up and as a habitat for biodiversity, under changing management and climatic conditions. Soil quality also underpins the capacity of our lands to exploit the high yield potential of modern grass and clover varieties in reseeded soils.

Soil quality and soil fertility

The nature of grassland farming, including grazing, soil disturbance during reseeding and grazing events, large offtakes of nutrients in milk, meat and silage, and machinery trafficking puts pressure on soil quality and soil fertility. Soil structure, which refers to the arrangement of sand, silt and clay particles, held together by SOM, is critical for grass and clover to develop adequate root systems to access sufficient nutrients and water to drive herbage yield. Soil biology influences soil physical quality, e.g. earthworms consume up to 20 t soil/ha when tunnelling and burrowing, and chemical quality through the decomposition of grass residues and dung paths and mineralisation of organic matter to release nitrogen (N), phosphorus (P), potassium (K), sulphur (S) and trace elements, etc.

Nutrient cycling in soils

Plant-available forms of macro- and micronutrients are relatively scarce in soil. The cycling of nutrients into and out of SOM is important to minimise the lock up of nutrients in the soil and prevent their loss to the environment. When soil quality is maintained, soils can: 1) safely accept manures and fertilisers, and make maximum use of the nutrients they contain; 2) sustain biological N fixation; 3) match mineralisation of nutrients to seasonal requirements; 4) maximise the recovery of nutrients; and 5) minimise nutrient loss risks. Soil quality and soil fertility levels affect each of these five aspects of nutrient cycling.

Feeding the soil and the grass crop

Fertiliser inputs are critical for high yielding grassland production systems, however, grass yields will be compromised if balanced nutrition cannot be supplied by the soil each day of the growing season. This balance and overall demand for nutrients will change over the course of the growing season due to changing growth rates and soil and weather conditions. For example, P is critical in springtime to drive early grass growth and provide energy for rooting and tillering, N and S demand is greatest during late spring and summer when

grass is growing rapidly and sufficient K is most critical to sustain high levels of grass growth in summer. Typically, intensively managed grasslands only receive 6–8 fertiliser applications throughout the growing season, which lasts for up to 10 months. Therefore, there is heavy reliance on soils to store, recycle and supply the appropriate N-P-K-S + trace element mix when required for grass production. This supply of nutrients can be more challenging if soils are compacted or if soil nutrient reserves have been depleted over time.

Fertiliser planning — right product, right rate, right time, right place

Knowing the pH and nutrient levels in the soil is important to develop an appropriate fertiliser strategy. The next information required is the nutrient off take from the different fields in order to replenish these nutrients with fertilisers or organic manures. A field-by-field fertiliser plan is the best way to utilise this information and develop a fertiliser and manure application strategy. The fertiliser planning system “NMP Online” develops tailored and easy to follow fertiliser plans with colour coded maps to guide lime, manure and fertiliser applications throughout the growing season.

Getting the balance right

Perennial ryegrasses, and especially clovers, are sensitive to soil acidity and regular monitoring of soil pH levels and applications of lime are essential. A balanced fertiliser programme is required to supply in-season plant available nutrients and maintain an adequate level of soil fertility by replacing all nutrient off-takes. For example, a 5 t DM/ha silage crop will remove ~20 kg P/ha (16 units/ac) and 125 kg K/ha (100 units/ac).

Return on Investment

Improving soil fertility is a worthwhile investment. Research shows that every €1 invested, in either lime, P or K, results in payback of €4 in extra production on low fertility soils (pH <6.5 and P or K index ≤2). For example, grass has been shown to yield at least 2.0 t DM/ha more, which is worth €275, at soil P Index 3 compared to P Index 1, regardless of fertiliser inputs. Supplying balanced fertiliser inputs and maintaining or building soil fertility has other benefits such as increasing the persistence of swards and helping to drive early season growth to extend the grazing season.

