Accuracy when using fertiliser

Nutrition is fundamental to crop yield. Soil testing, fertiliser type, timing application, rates and accuracy of spread, all contribute to maximising the crop's potential.

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Calculate the crop's needs before any fertiliser is applied. Over fertilising is expensive, potentially damaging to the environment and one of the leading causes of lodging. Once you apply it, you can't take it off.

Table 1 below shows the crop requirements for a 10t/ha winter wheat crop. Wheat and barley crops generally need approximately 3.8kg/ha of P and 10kg/ha of K for every tonne of yield grown, while oats have a slightly higher demand for K at 14.4kg/ha per tonne

Nitrogen Timing

Wheat, barley and oats require individual strategies due to their different growth habits. For example, we know that nitrogen is required in barley to form and maintain tiller numbers, as tiller number and ear number have a direct impact on final yield.

In wheat, however, nitrogen is generally needed later in the life cycle with the final application usually around flag leaf stage. The top four leaves in wheat contribute approximately 80% of the final yield so the aim is to try to keep these leaves alive and protect them from disease.

In the case of oats, research work completed in Teagasc Oak Park shows that a 50:50 split of nitrogen gives the best result. The tables below show the recommended nitrogen timings for the three winter cereal crops.

Application accuracy

Fertiliser calibration and set up is very important to ensure accuracy, so consult the manufacturer's guidelines for details. Technology has improved in the last number of years, and with the use of TAMS, many farmers have been able to upgrade their fertiliser spreaders to ones that can now spread more evenly and accurately.

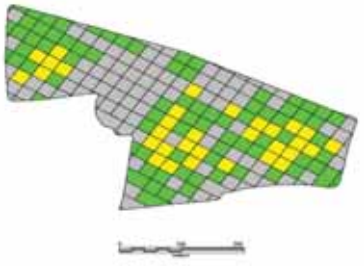
Whether it is the better headland management systems or the use of GPS technology, allied with yield and soil information maps, it is now possible to apply fertilisers more accurately than ever before.

Variable rate fertiliser applications are now becoming more common. This technology, using intensively soil tested fields and the maps generated (Figure 1), allows GPS-enabled fertiliser spreaders to accurately apply fertilisers depending on the soil test results and the crop requirement.

Table 1: P and K requirements kg/ha (units/ac) winter wheat crops at 10 t/ha - straw removed.

Soil index	P kg/ha (units/ac)	K kg/ha (units/ac)
1	58 (46)	127 (102)
2	48 (38)	113 (90)
3	38 (30)	100 (80)
4	0	0

Figure 1.



While it doesn't always result in lowering fertiliser costs, it can help to apply the correct amount of fertiliser to different sections of the field, which may have different requirements. This should, in turn, lead to more even and higher-yielding crops.

Modern sprayers (TAMS grants have helped enormously) allow farmers to apply plant protection products such as herbicides, fungicides, plant growth regulators etc, more accurately and safely. A growing number

Conor O'Callaghan and Martin Ennis.

Field experience

Martin Ennis farms near the Naul in north Co Dublin. Along with his mother, uncle and cousin, Martin farms just over 400ha including cereals, grassland and a beef enterprise.

"We started to intensively soil test fields back in 2016, when we felt a block of 28ha wasn't performing to its full potential," says Martin.

"Under-yielding areas were compared with other parts of the field."

Each hectare of the 28ha block was tested on a grid sample system and it was revealed that there was a large variation in soil pH across the field. The grid system showed on a hectare basis that 55% of the land was less than 6.0 pH, while the remaining 45% was optimal at greater than 6.4 pH.

With this information, Martin started variable rate spreading of the lime on this block to solve the pH problem, as he didn't want to over apply for fear of locking up vital nutrients.

He says: "There was a sizeable saving on lime and the savings outweighed the cost of the sampling." Similar maps were also compiled for P and K indexes across the field, and these were variable spread by a contractor.

Since then, Martin has sampled 90% of the owned land and 50% of the rented land and he has seen significant improvements in soil pH and P and K indexs. Less than 10% of the original 28ha block is now below 6.1pH, with the remainder greater than 6.2pH. P and K indexs are also on the increase.

"Crops are yielding more evenly and there is less of variation at seed establishment and harvesting," concludes Martin.

Martin has since availed of a TAMs grant to purchase a new mounted variable rate fertiliser spreader and says that the change "has been straightforward and easy, as the maps are loaded on a USB key plugged into the control box of the spreader.

"The accuracy and precision of spreading lime and fertiliser has dramatically increased, and we believe the farm has become more environmentally friendly and sustainable into the future."

Table 4: Nitrogen strategy for Winter Oats.

Reference yield	Total nitrogen* Index 1	First application (GS30)	Second application (GS31-32)
8.5 t/ha	140 kg/ha	70 kg/ha N	70 kg/ha N

of farmers are now using their sprayers to apply nutrients in the form of liquid nitrogen products.

While this is not new, the move to wider tramlines on some farms – 30 metres or more – has resulted in some growers experiencing difficulty in getting fertilisers to spread accurately.

One solution is to use the sprayer to apply fertilisers, as there are no overlays and it is more accurate on headlands, right up to the margins with no losses.

Fertiliser quality

Fertiliser quality also has a significant impact on spreading accuracy as we move to wider tramlines. Whether you are using straight products, CCF or blends of fertilisers, low grade or dusty material can be difficult to spread and will result in uneven crops. There are some simple tests that farmers can use, such as sieve trays, which filter the fertiliser granules into different size grades. More details are available on https://www.teagasc.ie/crops/soil--soil-fertility/.

Table 2: Nitrogen strategy for Winter Barley.

Reference yield	Total nitrogen* Index 1	First application Late tillering	Second application GS 30-31	Third application Before GS 32
9.5 t/ha	200	60 kg/ha	100 kg/ha	40 kg/ha

Table 3: Nitrogen Strategy for Winter Wheat.

Reference yield	Total nitrogen* Index 1	Mid-March GS 30	Early-mid April (Before GS 31)	Early-mid May (Flag Leaf)
10 t/ha	230 Kg/ha	63 kg/ha	113 kg/ha	56 kg/ha