A natural resource that's not unlimited

Phosphate used by agriculture is from a non-renewable source that is gradually being depleted, while a high percentage bypasses crops and is found in waterways. Simon Fox, CEO of biostimulant provider Optiyield, explains.

THE Guardian recently ran an article highlighting the worldwide issue that scientists are referring to as 'phosphogeddon', its impact on fertiliser stocks and the knock-on effects on world food supplies.

It is imperative to understand how phosphate is supplied, effectively used or wasted, not simply for growers' bottom line, but for the continued ability for humans to feed themselves.

Agriculture must acknowledge and fully understand three facts about the phosphate it uses to avoid 'phosphogeddon'. Only through this greater understanding can we start to make better and more sustainable choices in our use of additional phosphate applications.

Phosphorus used on farm today and consumed in food we eat is mined from a few sources of phosphate rock. This is unsustainable and by some estimates, there could be as little as 50 to 100 years' resource left, especially if we continue to consume it at the current rate.

In fact, 70% of the world's phosphate supply is controlled by four countries: China (39%), Morocco (17%), the US (10%), and Russia (6%). With supply geographically limited, it leaves the market exposed to massive fluctuations in costs and supply as a result of political disputes, trade wars and escalating fuel prices. Since 2020, the prices of both phosphate rock and fertiliser have increased by around 400% and continue to rise.

Phosphate Efficiency

Phosphate efficiency refers to increased crop health and the additional yield gained from supplementary applications of phosphate, or rather the lack of it.

There are a number of possible reasons for inadequacies of phosphate fertiliser recommendations and applications. They should encourage the industry to question not only the volumes being applied, but the methods of analysis and recommendation that lead to this.

Through the results of continued research and development of soil nutrient analysis methods, greater understanding of nutrient interactions/interdependencies and plant physiology should encourage the industry to question RB209.

Developed in the 1970s and based on research from earlier in the 20th century, a review of the assumptions it's based on and the recommendations it produces is long overdue, if for no other reason than the good management practice of 'reviewing procedures'. Is it still fit for purpose in today's environment? The RB209 philosophy of "topping up" soil reserves to meet a certain level is surely not only outmoded, but wasteful and potentially unethical in leading to higher levels of pollution risk.

Phosphate Waste

Phosphorus runoff from farms contributes to widespread water pollution. Admittedly most is not from agriculture. It's estimated that 59% of nitrates (ADAS, 2007) and 26% of phosphates (White and Hammond, 2006) in English waters are of agricultural origin.

Of the 26% of phosphate that comes from agriculture, particulate phosphate from tilled land accounts for 75-95% in the UK's waterways. This comes from phosphates sorbed by soil particles and organic matter which is eroded during runoff

and that has not been used by, or made available to, the crop.

There is positive news. The proportion of rivers exceeding 0.1 mg/l of phosphorus has declined in all regions between 2000 and 2009. However, 75% of lakes and 54% of rivers are still failing phosphorus standards.

The 'phosphate run-off' isn't just wasteful in monetary terms, but extremely damaging in environmental terms. The excess phosphate in our waterways is delivered to aquatic plants in the perfect format for them to utilise it, causing 'algal blooms'. The excessive aquatic plant growth 'chokes' the oxygen from the water body, killing fish and other microorganisms.

The bloom will typically last several weeks, after which the algae die. As it decomposes, it releases methane, a greenhouse gas (GHG) that is 80 times more harmful that carbon dioxide, into the atmosphere. Some of the world's best-known lakes have been affected, Lake Erie in North America, Lake Victoria in Africa and Lake Baikal in Russia.

The cost of phosphate run-off in our waterways isn't just environmental. The pounds shillings and pence cost to the agricultural industry for the estimated 60,000 tonnes of phosphate (P2O5) that is lost each year is equivalent to £90.6 million of Triple Super Phosphate (TSP).

Where do we go from here?

As phosphorus cannot be manufactured or destroyed and there is no substitute or synthetic option available, the existing deposits that are currently cost-effective to extract are being depleted. While there are some new deposits being found, the quality and the cost of extraction will do nothing to reduce future raw material costs.

The lifespan of the current mines can be extended through more effective and efficient use of phosphate. Current stocks can be used more efficiently by reducing the overall amount applied through targeted applications and, in turn, reducing the amount that is lost from the soil in runoff.

Reducing applied phosphate while maintaining crop tonnages can be achieved using targeted applications. First, establish how much there is currently in the soil and if it is in a crop-accessible format. When this information is combined with crop growth demand, the deficit is what needs to be applied.

Broadcasting fertiliser is a shotgun application, spreading it far and wide in the hope some will reach its target. Phosphate placed close to the seed at planting ensures it's within easy reach of newly formed roots to aid establishment from the start.

The use of foliar application removes the scatter or shot gun approach to phosphate/nutrient applications, delivering a predetermined dose directly to the crop leaves, making it available for use straight away. This considerably reduces the amount of waste and therefore runoff, benefitting the UK rivers as well as growers' bottom line.

The targeted approach to phosphate applications relies heavily on the accuracy of the soil tests and data they provide along with the frequency of testing, providing yet another set of historic industry standards that need to be re-evaluated considering new learning.

One of the worst management practices is to 'continue to do what we have always done' and to this end, it's time to review the recommendations that drive the use of phosphate in UK agriculture, the amount of phosphate and its method of application. Afterall nothing changes if nothing changes and, as far as phosphate is concerned, 'business as usual' is not a long-term option. PR