PHOSPHORUS

Phosphorus (P) is recognised as one of the four contaminants in Waikato Regional Council PC1, and although much fuss has been made of nitrogen, in the Waikato Region the majority of waterways are more phosphorus limiting rather than nitrogen limiting as far as algal growth is concerned, and yet phosphorus hardly gets a mention. As a lot of the phosphorus entering waterways comes from particulate run-off, fencing off waterways and having wetland on farms areas will have a big impact on reducing this, but there are some other mitigation strategies which should be considered.

At the moment Regional Council is falsely relying on Overseer to determine if a farm is high risk as far as P losses into the environment goes. As Overseer is partly owned and funded by the two big fertiliser co-ops, these companies have an econometric model attached to Overseer which their reps can use which helps establish best options for fertilising their properties. My observation from using Overseer though is that it overestimates the amount of phosphorus which is needed to sustain or improve production, and underestimates potassium. I often find farmers, dairy farmers in particular, after entering their soil test data and other farm operational factors into Overseer, are advised to apply excessive amounts of phosphorus and not enough potassium. The reason for this is that Overseer estimates that where a farm has high Olsen P levels, to maintain the current level of production, high levels of P are needed for maintenance, and it doesn't factor into the equation whether the farm is already above the biological optimum levels or not. P is a recognised contaminant in waterways whereas K is not, and P is also the most expensive element to apply. When soil particles from high P farms do enter waterways, this becomes an environmental problem, whereas soil particles from low P farms do not cause as much pollution.

Another problem is the almost universal use of the Olsen P test to measure soil phosphorus levels. There are better soil tests for acidic soils like ours used internationally. The Olsen P test was developed for alkaline soils in the mid-West of America by Dr Olsen of Colorado State University back in the early 50's. More than 20 years ago I abandoned the Olsen P test in favour of the more modern Mehlich III phosphorus test which I believe is a much better predictor of determining a phosphate response, and is now the most common assay used on acidic soils worldwide and also the favoured method used in the international scientific literature.

Because the Mehlich III (M3) extractant is a multi-element test, it has been used in some countries and states for environmental monitoring for determining what is sometimes called the Phosphorus Saturation Index or Phosphorus Saturation Ratio. The scientific literature shows the PSR/PSI is determined by the equation P/(Al + Fe) which is phosphorus divided by the total of aluminium and iron. On acidic soils, aluminium and iron are responsible for fixing water soluble phosphate fertilisers such as superphosphate, DAP, Triple Super, MAP and animal manures, into non soluble forms. Low water soluble phosphate fertilisers such as dicalcium phosphate, serpentine super and RPR fertilisers avoid or delay this fixation or locking up of the phosphorus and their direct application into waterways is therefore less environmentally damaging. The benefit of doing M3 soil assays is that one can quickly determine if the soil phosphorus levels are already beyond what the soil can hold and has the potential to be environmentally harmful. The international literature suggests the PSR or PSI threshold for causing environmental harm is as low as 0.1. This would mean that if the total iron and aluminium levels using the M3 extraction was for instance 1000 ppm, then phosphorus should not exceed 100 ppm. Since this research has already been done overseas, it can easily be used and checked here as the scientific methodology is the same. All of the major soil testing labs in New Zealand now have the technology to do Mehlich III tests. This will be a much more accurate way of determining whether a farm's phosphate status is likely to cause environmental harm compared to using the Olsen P values typed into the Overseer model.

Having a better, more modern phosphate test using the Mehlich III assay where iron and aluminium are also measured from which Phosphorus Saturation Indexes can be determined is I believe a much better tool for reducing phosphorus contamination of waterways. Also for farmers, because the Mehlich III test is a better predictor of a phosphate response, it means they will not be wasting their money applying phosphorus when it is not needed, but can apply it when it will give an economic production response.

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