

Efficient use of phosphorus

For the health of our waterways and groundwater

GENERAL INFORMATION

More than three million tonnes of fertiliser are applied each year to New Zealand farms.

As fertiliser is one of the larger farm costs, managing this resource well helps boost the farm's financial bottom line through optimum pasture production, while helping protect the environment.

NUTRIENT BUDGETS AND MANAGEMENT PLANS

Having a nutrient budget and a nutrient management plan is essential for efficient nutrient use. They will help minimise any adverse environmental effects from nutrient application. Phosphorus (P) is generally one of the first nutrients considered for soil supplementation by farmers. One important source of P is manufactured fertiliser, although it will also enter the farm gate in the form of supplementary feed and will be found in dung.

PHOSPHORUS AND SOIL FERTILITY

P is important for pasture production as New Zealand farming is dependent on supplementing naturally occurring low P soil levels. However, when these levels exceed the recommended optimum range, environmental risks increase. In some New Zealand catchments there is already damage from high P run off from farms.

On average, near maximum pasture production can be achieved with Olsen P levels within the optimum range. It becomes wasteful to have higher than optimum levels in most situations because higher P applications are required to maintain higher Olsen P levels and there is no corresponding increase in pasture production. To have Olsen P levels above this range invites unnecessary environmental damage. Following is the optimal Olsen P range for near maximum pasture growth for each major soil order in New Zealand.

OPTIMAL OLSEN P LEVELS

SOIL ORDERS	Optimum range Olsen P
Palic soils (yellow grey earths)	20-30
Brown soils (yellow brown earths)	20-30
Recent soils (from alluvium)	20-30
Allophanic soils (ash soils)	20-30
Pumice soils	35-45



Steeper slopes increase the risk of phosphorus loss to water.

PHOSPHORUS AND SEDIMENT

Managing P is also about managing sediment loss from the farm because most P leaves the farm attached to very fine sediment particles. Cutouts and berms along raceways channel water back into a paddock and so help to reduce P running directly to waterways.

Avoid pugging in winter because this will also reduce sediment and P loss from the farm. Leaving a margin between waterways and cultivated paddocks is another way of reducing P loss. Many farmers have fenced off waterways to reduce stock losses and prevent dung and urine entering water. Some have planted these riparian margins with suitable plants. These margins stabilise stream banks and assist in the capture of sediment and P, further preventing loss of P from the farm.

CRITICAL SOURCE AREAS

Typically, 80 per cent of P loss can sometimes come from less than 20 per cent of the farm area. Runout pasture or pasture damaged by insect pests, with a lower pasture cover and more bare ground, can become a critical source area. Other critical source areas are cultivated paddocks, new race construction, building sites and any other areas where soil is exposed or disturbed on the farm. Use sediment traps in these situations to lower sediment and P loss.

More recent research has found that P and sediment run off from races is considerably higher than from farm paddocks. Races should be considered a critical source area so special attention to directing water and sediment from them is required.

PHOSPHORUS AND SOIL SLOPE

The risk of P loss increases with increased slope and erratic intensity and duration of rainfall. However, when P loss mitigation is introduced less P will be lost during these events. Careful management of stock on sloping land, particularly near waterways and during wet periods, is required. Reducing the energy intensity of water leaving the farm by maintaining healthy riparian areas and protecting wetlands will allow sediment to settle and reduce P loss.

One way to reduce P loss from the farm to waterways is to plant the steeper low producing slopes in trees. Regular cutouts along races and tracks to allow water to flow back into the paddock is another mitigation strategy that will reduce P loss.

PHOSPHORUS AND EFFLUENT

Applying dairy shed effluent at low rates and in conditions that allow for total infiltration allows time for transfer of P from effluent to soil. When soils are saturated there is a high risk of P run off. Effluent storage and deferred irrigation will reduce P loss from the farm.

SPREADING PHOSPHATE FERTILISER

Use a soluble phosphate fertiliser when:

- rapid plant response is required
- soil P levels are to be increased rapidly
- plants are actively growing
- there is a low risk of run off.

Slow release phosphate fertiliser is used when:

- there is a risk of P run off to sensitive catchments
- a rapid response is not required
- soil P levels are adequate
- soil pH is less than 6.0
- annual rainfall is adequate.

Soluble phosphate fertiliser must be applied in split dressings if single applications exceed 100kg P/ha. Allow a reasonable margin for waterways when applying fertiliser. Follow Spreadmark code of practice guidelines (e.g. do not apply phosphate fertiliser in a drought, wait until pasture is at least 25mm high, apply only when wind speeds are less than 15km/hr, do not apply P fertiliser when the soil is saturated).

PHOSPHORUS MITIGATION STRATEGIES

- Maintain Olsen P levels within the optimum range.
- Install effluent storage and apply effluent when run off risk is low.
- Use cutouts and berms to redirect run off from races to paddock – ensure run off from races cannot directly enter a ditch or stream.
- Maintain soil permeability by avoiding pugging and soil compaction.
- Leave a good buffer zone between waterways and cultivated paddocks.
- Fence and plant riparian margins.
- Carefully manage stock on sloping land during wet weather to maintain pasture cover.
- Prevent stream bank erosion.
- Use sediment traps where critical source areas can be identified.
- Soil test regularly and monitor soil P levels.
- Review nutrient management plans regularly in consultation with a nutrient advisor.

MORE INFORMATION

Contact

- Waikato Regional Council
Freephone 0800 800 401

Publications

Download or order the following publications at www.waikatoregion.govt.nz/publications or freephone 0800 800 401:

- Making Dollars and Sense of Nutrient Management. Dairy NZ.
- Farm Enviro Walk. Your on-farm environmental health check list. Dairy NZ.
- Land and Environment Plans (Levels 1, 2 and 3). Beef and Lamb NZ.

Other factsheets in this series:

- Effluent management
- Environmental hotspots
- Managing soil fertility
- Nitrogen
- Nitrogen leaching
- Nutrient management
- Soil management
- Waterway management

Web

- www.waikatoregion.govt.nz/ForFarmers
- www.dairynz.co.nz
- www.fertqual.co.nz