

Managing soil fertility

The need to manage soil fertility

New Zealand soils are relatively young in geological terms and often require nutrient supplementation to support the high level of production we have come to expect from them. Nutrients leave the farm in the form of meat and milk and escape via waterways, leaching and the air, so they need to be replaced.

Fertiliser prices now represent a significant part of a farm's financial budget. Careful adjustment to soil fertility levels and soil acidity are required to ensure optimum grass growth from the farm fertiliser expenditure. Your fertiliser representative will help you with this task or you can obtain independent advice from agricultural consultants.

GENERAL INFORMATION

Soil acidification is a natural process. Increasing the amounts of carbon and nitrogen used by growing plants, as is done in agricultural production systems, usually leads to soil acidification.

pH

A measure of soil acidity is the pH. If soils are too acidic, aluminium and manganese become toxic to the plant. If pH levels rise above 7.0 then deficiencies in iron, manganese, zinc, copper and cobalt may occur. Aim for a pH of between 5.8 and 6.0 for optimum pasture growth. On peat soil aim for a pH between 5.0 and 5.5.

Calcium

Liming reduces soil acidity. In the process it enhances the mineralisation of organic matter and thereby increases the release of plant nutrients. It also improves soil structure and makes phosphorus more readily available to plants. Lime encourages earthworm activity and helps to increase their numbers.

Phosphorus

In general phosphorus is a very important plant nutrient of which soils are in short supply. So we supplement our soils with phosphorus. It attaches itself to soil particles so little phosphorus leaching occurs. However, erosion of topsoil by wind and water removes these soil particles. The phosphorus entering streams increases aquatic plant growth and degrades waterways. Note that it only takes a very small amount (0.015 to 0.03 parts per million of phosphorus) to promote algal growth in freshwater streams and lakes.



Potassium

Plants require relatively large amounts of potassium but animals do not. Animals excrete the unwanted potassium in dung and urine. Potassium is lost by leaching in drainage water and will need replacing over time. Note that effluent areas of the farm usually receive more potassium than they require for optimum pasture growth. One way of balancing this surplus potassium is to make silage and hay from effluent areas and feed it out on non-effluent areas. This effectively transfers some of the surplus potassium to other parts of the farm.

Growing maize, a high potassium demanding plant, on the effluent area is another way to better utilise potassium on the farm.

Sulphur

Sulphur is essential in forming plant and animal proteins. The main store of sulphur is in organic matter. Unfortunately sulphate-sulphur is not strongly held by soils (allophanic soils are an exception). Sulphur tends to be leached to the subsoil where it has limited availability to pasture plants. So, unless you are close to the coast, sulphur supplementation is required to keep pasture performing at optimum levels.

Optimal chemical ranges for pumice, allophanic and organic soils

SOIL TEST	PUMICE	ALLOPHANIC	ORGANIC
Soil pH	5.8-6.0	5.8-6.0	5.0-5.5
Olsen phosphate	35-45	20-30	35-45
Quick test potassium	7-10	7-10	5-7
Organic-sulphur	15-20	15-20	15-20
Sulphate-sulphur	10-12	10-12	10-12
Quick test magnesium	8-10	8-10	8-10

Magnesium, calcium, sodium, zinc, cobalt, selenium, copper and iodine should be considered as they are important for plant and animal health. Some substances found in fertiliser in small quantities, like cadmium and fluoride, can affect stock health.

RECOMMENDED ACTIONS AND BEST MANAGEMENT PRACTICES

- Soil test regularly every two years.
- Divide the farm into different blocks by soil type, management unit and so on, and soil test separately.
- Soil test effluent paddocks separately from other blocks on the farm.
- Keep the pH between 5.8 and 6.0 for maximum pasture growth.
- Maintain nutrient levels like phosphorus, potassium and sulphur in the optimum range.
- Make supplements on the effluent area and feed them out on the rest of the farm to help distribute effluent potassium around the farm.
- Reduce phosphorus levels to optimum if they are unusually high. This will reduce your maintenance of phosphorus on these blocks and reduce losses to waterways.
- Fence off riparian margins. They will act as filters for any phosphorus leaving the farm attached to fine soil particles.
- Ensure fertiliser is not spread over waterways.
- Avoid fertiliser application in, or just prior to, heavy rain.
- Banding fertiliser application (as opposed to broadcast) will place fertiliser next to the root zone of crops.

Maintain nutrient levels like phosphorus, potassium and sulphur in the optimum range.

MORE INFORMATION

Contact

- Waikato Regional Council
Freephone 0800 800 401

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