

Efficient Fertiliser Use

Introduction

Fertiliser is an effective tool for maintaining agricultural production from crops and pasture. Studies show that withholding fertiliser will result in reduced production - as much as 30% within seven years on hill country pastures.

General indicators of poor soil nutrient status on pastoral properties are:

- the dominance of low fertility species in the pasture sward like browntop and Yorkshire Fog.
- poor growth of pastures in the spring flush.
- persistent dung and urine patches.



Careful use of fertiliser can be better for our environment and save money.

Fertiliser is necessary to maintain pasture health and improve production but increasing fertiliser application levels beyond the ability of the crop or pasture to absorb the extra nutrient will result in a surplus that is leached away. With no growth benefit this surplus represents a net financial loss. Also, producing more forage than stock can utilise at any one time represents a similar financial loss. While farmers may be tempted into applying increasing amounts of fertiliser in the hope of gaining

greater production, biological and environmental constraints mean they can waste money and risk contaminating local water resources through leaching or runoff of excessive nutrients. Build up of weeds and algal blooms in local waterways are the result.

Fertiliser Requirements

To accurately determine soil nutrient status, soil test at two yearly intervals. To do this, divide the farm into land units with similar soil types and topography. Set up at least three sampling lines in each unit and avoid atypical conditions such as tracks, stock camps, fence lines, etc.

Collect a sample of at least 15 cores on each line, taking plugs to a depth of 75 mm on pasture or 150 mm in cropping paddocks. Do not soil test within three months of a previous fertiliser application. Collect samples in the same month of the year every time soil testing is done, and preferably a few weeks before the intended application of fertiliser.

To spread the effort and cost of soil testing (and fertiliser application) consider doing half the farm one year and the other half the next year. Maintain a record of soil test results and fertiliser applications for each land unit.

Fertilisers

For maximum plant uptake of major nutrients, pH should be within the neutral (mid scale) range. Additional corrective inputs of lime or sulphur may be required.

Lime may also be needed to correct calcium deficiency. Most pastoral soils in the Bay of Plenty require specific trace elements as well, especially cobalt. Nitrogen (N) is a major nutrient for pasture growth. The application of 25 kg N/ha can produce up to 250 kg/ha additional dry matter (DM) depending on seasonal factors. If the N fertiliser costs \$1/kg applied, then the cost of extra DM production is 10 cents/kg.

This sort of calculation can be used to determine the economic viability of increasing fertiliser levels, but biophysical constraints will apply.

The ability of plants to take up nutrients is largely governed by three factors:

- soil moisture;
- soil temperature; and
- leaf area (capacity for photosynthesis).

For pastoral properties in the Bay of Plenty it is generally recommended that no more than 200 kg/ha of N is applied per year. Studies indicate around 150 kg is an economic optimum, boosting seasonal production by 20% when broken down into a series of applications of 50 kg/ha or less.

Most benefit from fertiliser application occurs when growing conditions are at their best (e.g. spring). Intensive use of N to promote growth of grass species can have a competitive/suppressive effect on pasture legumes however, and total annual DM production may experience a relative decline.

Guidelines for Application of N Fertiliser

To use N fertilisers efficiently and avoid pollution of groundwater by nitrate leaching, the following practices are recommended:

- Before applying N, ensure pasture growth is sufficient for plant uptake; pasture should be 25 mm high (around 1,000 kg DM/ha) and soil temperature above 5°C.
- Do not apply N fertiliser if significant rainfall (>20 mm) is expected within 24 hours.
- Do not apply N fertiliser when soils are saturated and puddles are present.
- If applying N to areas with high natural water tables use small amounts and select a product with a less mobile form of N (low nitrate level).
- Take care with storage and handling. Water seeping into stored N fertiliser or spillage will waste fertiliser and increase the risk of leaching.

General Guidelines

To get the best utilisation of applied fertiliser, and to avoid contamination of waterbodies from runoff or drift, the following practices are recommended:

- Use the pasture growth guideline above. Maintaining residual DM also helps to prevent erosion of fertile topsoil.
- Withhold applications if heavy rainfall is expected or if soils are saturated.
- On steep sites near waterways split fertiliser applications i.e. apply smaller amounts more frequently.
- Consider riparian buffer strips around permanent streams. If such zones are fenced to prevent stock trampling of streambanks/channels, sedimentation of local waterways is also reduced.

- Environment Bay of Plenty offers financial assistance for fencing and planting such areas.
- Avoid ground application within 10 metres of open water.
- Ensure equipment is calibrated properly for even distribution of fertiliser and use experienced operators.
- Avoid application on compacted or heavily pugged soils.
- If applying fertiliser after a drought, wait until sufficient rain has fallen to restart pasture growth. Premature application is at risk of runoff because of slow infiltration rates in excessively dry soils.
- For aerial application or when wind speed towards open water is 5 km/hr or more, use products with suitable ballistic properties and techniques that allow accurate placing of fertiliser applications.
- Do not locate storage and handling/loading sites within 50 metres of open water.

Other Factors

To help reduce the need for more fertiliser also consider the following factors.

Rotation

Avoid set night and day paddocks to prevent fertility transfer, especially where pasture cover is poor or soil is shallow or compacted. Similarly, graze sidelings separately from terraces and valley floors if possible.

Pasture Species

A wide range of pasture cultivars is now available. Select those which are best suited to the conditions within respective land units on the farm.

Innocation

When establishing new legume cultivars, ensure seed is inoculated with the correct strain of rhizobium to promote fixing of atmospheric nitrogen in the plant root system. On some sites, inoculation with mycorrhizal fungi may also be useful to assist uptake of phosphate fertiliser.

Seek Advice

In addition to performing regular soil tests before applying fertiliser always seek advice from fertiliser company representatives, agricultural consultants or research authorities such as AgResearch. All have access to trial data and a certain amount of local experience, which can assist with determining economic fertiliser requirements.

Further Reading

Code of Practice for Fertiliser Use published by NZ Fertiliser Manufacturer's Research Association, P O Box 9577, Newmarket, Auckland.



For further information and advice, contact your local land management officer at Environment Bay of Plenty:

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