FACTSHEET

Hill Country Futures: Nutrient and lime requirements of lucerne

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Lucerne is a tap-rooted legume that can extract water and nutrients from deep in the soil profile. Nutrient requirements, particularly potassium (K), are higher when lucerne is cut for hay or silage, compared with when it is grazed. This factsheet discusses lucerne's nutrient and lime requirements.

Key message

- Under grazing, lucerne swards generally require annual maintenance applications of lime, phosphorus (P) and sulphur (S), but only K if soil Quick Test K (QT K) levels are less than 5.

With good management, which includes monitoring the levels of key nutrients in the soil and lucerne plant, stands can persist for 10 years or more.

pH

Rhizobia associated with lucerne have a low tolerance for soil acidity, so require a soil pH of 6.0-6.4 in the top 150 mm at sowing. This increases molybdenum (Mo) availability for N fixation. To increase pH, apply lime 6-12 months before sowing. To increase soil pH by 0.1 units in the top 150 mm, apply 1-1.5 t/ha of lime.

Phosphorus (P)

Soil Olsen P levels in the top 150 mm of the soil should be:
15-20 - Sedimentary and ash soils
20-25 - Pumice soils.

If P levels are below these ranges, apply 30-60 kg P/ha at sowing.

Assuming yields of 10-15 t DM/ha, maintenance P requirements will range from:
15-25 kg P/ha/yr - If the lucerne is predominantly grazed
20-30 kg P/ha/yr - If the lucerne is predominantly cut for hay or silage.

Sulphur (S)

As a legume, lucerne requires S.

To overcome a deficiency, 20-40 kg S/ha/yr is required. S deficiency commonly appears as yellow leaves that look nitrogen (N) deficient in the first rotation in spring – after a wet winter which has leached the S from the profile. A spring herbage test can confirm this.

If applying during:
Autumn- Use elemental S to reduce the risk of leaching during a wet winter
Spring - Use sulphate S which is available to the plant more readily after application.

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Potassium (K)

In most New Zealand soils, there is sufficient K for lucerne establishment and fertiliser K is not required at sowing.

However, lucerne crops yielding 10-15 t DM/ha/yr will take up 200-300 kg K/ha/yr from the soil, so maintenance fertiliser K is recommended, particularly if the crop is often cut and carried.

The image shows K deficiency in a Central Otago stand used predominantly as a cut-and-carry crop.

Situation	Fertiliser K requirements
On sedimentary soils: a) With high TBK (tetra-phenyl boron extraction) levels indicating high reserves (>1 meq %) and b) Where the lucerne is harvested	Apply 50-100 kg K/ha/yr after the last crop has been harvested
On all soils with low TBK levels (<1 meq %)	Apply 100-200 kg K/ha/yr after the first two cuts, and at the end of harvest season
Under total grazing, where QT K levels <5	Apply 20-30 kg K/ha/yr
Under total grazing, where QT K levels >5	No fertiliser required

Magnesium (Mg)

Most soils have adequate Mg (QT Mg of 8-10) to meet lucerne's requirements.

The exceptions are:

1) Pumice soils can be low in Mg. If a test shows low levels (i.e. below QT Mg 8), apply 20-30 kg Mg/ha as Kieserite at sowing.
2) Continual harvesting of a lucerne stand may necessitate maintenance applications of Mg. If soil QT Mg levels decline over time into the low range, apply 10-20 kg Mg/ha/yr.

Nitrogen (N)

On soils with very low soil fertility (Olsen P <10) or when direct drilling, there may be an establishment advantage from applying 20-30 kg N/ha at sowing, for example as di-ammonium phosphate.

Molybdenum (Mo)

Apply Mo if:

a) The lucerne stand is on soils where Mo is required for clover growth, or
b) The lucerne Mo content is less than 0.5 ppm and N is less than 5% in a herbage test

Apply either:
100 g/ha of sodium molybdate
OR
200 g/ha of granular Mo at sowing and then every 4-5 years, following a herbage test.

Lucerne stands on recent alluvial soils should not require Mo. Maintenance of a pH near 6.0 will also ensure Mo is available.

Boron (B)

On pumice and free draining soils, B may be required at sowing. If so, apply 1-2 kg/ha of elemental B.

Copper (Cu)

There should be adequate Cu in the soil to satisfy lucerne's requirements.

The exception is pumice soils, where 5 kg/ha of Cu sulphate may be required at sowing.

Example: Soil nutrient changes

This table shows soil nutrient changes, following the application of lime and superphosphate.

Soil test results (0-15 cm) for pre (2008) and post (2010) fertiliser applications from three Central Otago farms.

	pH	Olsen P (µg/ml)	Potassium (QT K)	Sulphur (µg/g)	Aluminium (mg/kg)
Pre-Development (2008)					
Hills Creek	5.2	10	5	14	2.6
Huntleigh	5.2	10	5	1	6.3
Styx	5.2	13	13	3	5.7
Post-Development (2010)					
Hills Creek	5.8	19	9	31	0.9
Huntleigh	6.0	18	4	25	1.5
Styx	6.1	29	13	23	1.1

Lime 3-5 t/ha and 250+ kg/ha superphosate

Kearney et al. 2010

Conclusion

Lucerne stands should be soil and herbage tested annually to ensure adequate plant nutrition. Soil test in autumn to prepare for spring fertiliser applications. Herbage test in mid spring when the crop is growing at its fastest rate and only sample the 15-20 cm of leafy herbage. (Avoid hard stem material in the sample.)

Further reading

This factsheet is part of the Hill Country Futures soil and fertiliser series. The full series can be found at www.hillcountryfutures.co.nz/resources/soil-and-fertiliser-series

"Fertiliser use on New Zealand sheep and beef farms" booklet, produced by the Fertiliser Association of New Zealand. Download at: www.fertiliser.org.nz/Site/resources/booklets.aspx

"Fertiliser use on New Zealand forage crops" booklet, produced by the Fertiliser Association of New Zealand. Download at: www.fertiliser.org.nz/Site/resources/booklets.aspx

Kearney, J.K., Moot D.J., Pollock, K.M. 2010. On-farm comparison of pasture production in relation to rainfall in Central Otago. Proceedings of the New Zealand Grassland Association 72: 121-126.

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