

FACTSHEET

Hill Country Futures: Sulphur requirements

April 2022

Legumes require sulphur (S) to fix nitrogen (N) and make proteins, which in turn benefit the whole pasture sward. New Zealand hill country soils have limited ability to retain plant available inorganic sulphate sulphur (sulphate-S) on exchange sites. This is especially true on soils formed in low rainfall environments. Organic S, which makes up the bulk of the total S in soil, slowly increases over time with pasture development. Most of the plant available sulphate-S comes from the mineralisation of that organic S. Once in the inorganic form sulphate-S is vulnerable to leaching. Therefore, S needs to be incorporated into the fertiliser programme.

Key messages

- S is required on nearly all hill country soils
- If fertiliser is applied in the autumn then some of the S should be applied in the elemental form, in high rainfall environments.

S is required on most hill country soils because sedimentary soils are unable to supply S to plants.

Animals do recycle S, but inefficiently, because their dung and urine patches are concentrated in low slope and camp areas rather than spread evenly across the paddock.

Types of S fertilisers

S fertilisers contain S in either its sulphate or elemental form.

Sulphate sulphur (sulphate-S): In this form, the S is readily available for plants to take up immediately after application. The most common example of a sulphate-S containing fertiliser is single superphosphate. Another is sulphate of ammonia containing S and N.

Elemental sulphur (elemental S): Elemental S must be oxidized by soil bacteria to become sulphate-S – and it is only available to the plant at that point. It is therefore a slower-release fertiliser option. An example of elemental S containing fertiliser is sulphur superphosphate.

Fertiliser	Type of S	When to apply	Availability to plant
Superphosphate	Sulphate-S	Spring / early summer	Immediate
Sulphate of ammonia			
Sulphur superphosphate	Sulphate and Elemental S	Late summer to autumn	Slow release

If fertiliser is applied in autumn, some elemental S is needed, especially where annual rainfall is above 1000 mm. This is to ensure there is sufficient S available for plants the following spring because S can leach in drainage water over winter.

Soil testing for S

There are three soil tests that measure S levels. Each measures a different aspect of S availability.

Test type	Measures	Target range (ppm)
Sulphate-S	S immediately available to plants	6-8+
Extractable organic S	Amount of organic S that can be readily converted to Sulphate-S	15-20
Total S	Soil's ability to supply S from the organic pool	300-900

Application rates

Research shows that at least 20 kg S/ha/yr is required to satisfy pasture requirements on sedimentary soils carrying 10 SU/ha.

For a hill country farm wintering 10 SU/ha, with a soil Sulphate-S level of 6-10 ppm and Olsen P of 12-15:

Quantity	Fertiliser	Supplies
200 kg/ha	Sulphurgain 20S OR	40 kg S/ha/yr and
	Sulphur Super 20 (50/50 sulphate and elemental S)	14 kg P/ha/yr

These rates of S application satisfy pasture S requirements and maintain soil Olsen P levels. At higher or lower stocking rates then higher or lower S levels will be required.

N.B. Approx 60-70% of the elemental S in these two fertilisers will be available in the year of application.

Conclusion

The S in sulphate-S fertilisers is readily available to plants, while elemental S fertilisers must be oxidised by soil bacteria before the S is available. Elemental S fertilisers are more effective on soils with high rainfall when applied in the autumn.

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 the Fertiliser Association of New Zealand booklet. Download at: www.fertiliser.org.nz/Site/resources/booklets.aspx

Acknowledgement

Funding for this project was provided by Beef + Lamb New Zealand, MBIE, Seed Force New Zealand and PGG Wrightson Seeds, as part of the “Hill Country Futures” research programme (BLNZT1701).

Factsheets are made possible by sheep and beef farmer investment in the industry. Beef + Lamb New Zealand is not liable for any damage suffered as a result of reliance on the information contained in this document. Any reproduction is welcome provided you acknowledge Beef + Lamb New Zealand as the source.