

Soil and Nutrient Network



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Helping farmers improve soil and nutrient management

Case study - Lyking Farm, Sandwick, Orkney

Lyking farm is a 174ha suckler cow unit based in the parish of Sandwick, some 12 miles from Orkney's main town of Kirkwall. Its 120 spring calving cows are mainly Simmental crosses which run with Limousin and Simmental bulls to produce stores sold at around 18 months of age. Their diets at housing consist of home-grown silage, barley and straw, supplemented with a small quantity of purchased protein.

The soils at Lyking are all non-calcareous gleys of the Thurso association derived from Old Red Sandstone, and fall into two different soil series. The best land is of the imperfectly drained Bilbster series, whilst the heavier soils fall under the poorly drained Thurso series.

The land is categorised under the Macaulay Land Capability for Agriculture (LCA) classification as 4.1 and 4.2. which is land capable of producing a narrow range of crops, primarily grassland, with short breaks of cereal and forage crops.



Lyking Soil Analysis

A visual evaluation of soil structure (VESS*) was undertaken at Lyking. Compaction issues were found in two fields, one which had recently been reseeded and another in a 30 year old sward. The recommended remedial action depended on the depth and extent of the compaction, with a sward lifter and a soil aerator being possible options.

Appreciating the benefit of a good soil structure, the business has introduced some novel plant species into its new grass swards. The deep roots of Burnet (pictured), Yarrow and Sheep's parsley will help to break pans, aerate the soil and also access minerals deep in the soil profile to benefit the livestock which graze it. Maintaining the Ca:Mg ratio at no less than 4:1 or above is also important. Calcium pushes soil particles apart helping aeration and magnesium sticks them together. At Lyking, the soils were all at 6:1 or above, undoubtedly helped with the use of the local calcareous shell sand.



Worm numbers at Lyking also indicated good soil health. >9 is considered very good in a square spade section and 14 were found in some fields on the farm. The organic matter levels measured by LOI and the Potentially Mineralisable Nitrogen (PMN) recorded in the fields also suggested that the soils were generally in a state of good biological health.



* Find out more about Soil structure and how to make a Visual Evaluation of Soil Structure in the Valuing Your Soils booklet which is available to download from the [Soils](#) section of the Farm Advisory Service website.

For more information on the Soil and Nutrient Network see www.fas.scot For dates of SNN events, find us on Facebook or follow us on Twitter @FasScot



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Soil pH

Maintaining the pH at around 6.0 on the mineral soils at Lyking is a key requisite of good soil health. The high rainfall in Orkney, together with the application of some fertilisers such as ammonium nitrate, accelerates acidification of the soil. Regular testing and appropriate use of shell sand and granulime are therefore essential. Granulime works faster than shell sand in neutralising acidity and can be applied using conventional fertiliser spreaders, however it is much more expensive and requires more regular applications.

Granulime = £182/t delivered . Shell sand = £20/t delivered and spread

Granulime at 54% CaO = £3.37 per 1% CaO. Shell sand at 32% CaO = £0.63 per 1% CaO

1 tonne of lime* = 0.92t of Granulime (50/54) costing **£167.44**

1 tonne of lime* = 1.56t of shell sand with NV 32% CaO (50/32) costing **£31.20**



*SAC soil recommendations assume lime with 50% CaO

Slurry, a valuable resource

Orkney's island location leads to high freight costs therefore it's critically important to utilise the available resources within the county to maintain soil fertility.

Analysis of the fields at Lyking showed there to be remedial action required to raise soil phosphate levels. Analysis of the slurry on the farm helps to determine its capacity to address these deficiencies.

2000 gallons (a tanker load) of Lyking's cow slurry contains the equivalent of 1x50kg bag of 12*:20:68 whilst 2000 gallons of the yearling's slurry equates to a 50kg bag of 22*:30:78. The 120 suckler cows and followers on the holding will produce around 500,000 gallons of slurry over the winter housing period.

	Lyking Cow Slurry	Lyking Yearling's Slurry
Dry Matter (DM) %	7.39%	8.17%
Total Nitrogen (kg/1000 gal)	10.26	18.88
Total Phosphate (kg/1000 gal)	4.95	7.7
Total Potash (kg/1000 gal)	17.25	19.50

The FAS Technical Note TN715 Phosphate and potash recommendations for crops grown in Highland and Islands suggests applying an extra

* Assumes 30% availability of N

Lyking Soil Analysis

Field	PMN	LOI	Worms	VESS
Barley	56.2	10.84	6	SQ2
30yr PGRS	70.9	12.32	14	SQ3+
Wet PGRS	58.1	9.48	0	SQ4+

PMN. Potentially Mineralisable Nitrogen is an indicator of the soil microbial community. >50 = good.

LOI. Loss on Ignition carbon measurement >5=good.

50kg/ha of P₂O₅ each year in fields low in phosphate. This is equivalent to 2,500 gallons/acre of the Lyking yearling calf slurry.

Based on 2020 fertiliser prices, 2000 gallons of these slurry's are valued at £30.40 and £40.24 respectively. The 1/2 million gallons produced annually are therefore worth between £7,605 and £10,060 in N, P and K. Additional benefits, including organic matter and trace elements, have not been quantified.

Value of 1000 gallons of Lyking Slurry			
Lyking Cow slurry		Lyking Yearling's slurry	
N 3 kg	£ 2.25	N 5.6 kg	£ 4.20
P 4.95 kg	£ 3.65	P 7.7 kg	£ 5.39
K 17.25 kg	£ 9.31	19.5 kg	£ 10.53
Total	£ 15.21	Total	£ 20.12

Fertiliser prices

- Nitram (34.5% N) @ £ 257/tonne = £0.75/kg N
- TSP (46% P) @ £ 323/tonne = £0.70/kg P
- MOP (60% K) @ £ 324/tonne = £0.54/kg K

Top tips on soil biological health

- Maintain a pH of 6 –6.2
- Minimise compaction and alleviate compacted areas with appropriate machinery.
- Minimise disturbance as excessive tillage harms the soil biota.
- Feed the soil biology with crop residues slurry & FYM.
- Avoid bare soil e.g. don't leave fields ploughed over winter.
- Diversify rotations where possible and include diverse plant mixtures with different rooting depths.
- Avoid pesticides and heavy applications of bagged fertiliser.
- Maintain good clover levels to reduce reliance on bagged N.
- Keep the Ca:Mg ratio at 4:1 or above to aid good soil structure.