

Soil and Nutrient Network



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Helping farmers improve soil and nutrient management

Case study - Kincaraigie, Auchlossan, Aberdeenshire

Father and Son duo, Robert and Robert Marshall Jnr farm the land at Kincaraigie, totalling 664.64ha (1,642.33 ac). This is made up from 542.77ha (1,341.18 ac) permanent land and a further 121.87ha (301.15 ac) seasonal land. The land is split with approximately 120ha in arable production and the remainder in grassland.

The only cereal grown on farm is spring barley which is all kept at home as feed and bedding, for the suckler cow herd through the winter months. Kincaraigie runs a herd of 500 suckler cows with progeny either sold as store cattle or fattened and sold straight to the abattoir. The farm has both straw bedded courts and slatted courts meaning there is an abundance of muck and slurry to be spread annually. The FYM is only spread on ground that is ploughed down in the spring for spring barley. Slurry is utilised on the grassland, mainly on the silage fields to help increase yields and cut back on inorganic fertilisers use.

The soils are varied with land capability indexes ranging from 3.2 to 5.2, are mainly within the Countesswells soil series and are freely draining. All the grassland is either grazed by the suckler herd or cut for silage to provide winter feed.



Soil Sampling and Analysis

At Kincaraigie soil sampling is carried out occasionally but predominantly on the arable fields and not as routinely on the grassland. As part of project a selection of 12 arable and grassland fields were sampled in the conventional W-pattern sampling method. The fields that were chosen were a selection of good, poor and mixed performing fields. In addition to the organic matter and routine tests, trace mineral contents were also analysed. A summary of the analyses can be seen in Table 1.

The pH values ranged from 5.1 to 6.0 with an average of 5.7. Many of the fields would benefit from the application of lime which is one of the topics that will be looked at over the course of the project. Phosphate and potash levels also vary greatly from low to high across the selection of fields sampled. The farm has a lot of slurry and FYM to be spread and the fields that are high in P and K are found closer to the steading and typically receive the most organic manure applications.

The Organic matter (OM) results show that Kincaraigie has good OM levels in their soils and is a classic example of a barley and grass rotation working with a well stocked farm. The presence of cattle and the amount of organic manure applied on the fields have ensured that the organic matter has remained relatively high and active over the years, with an average of 9.45%.

Table 1. Soil sampling analysis results from 12 fields at Kincaraigie

Field	pH	P	K	Mg	OM (%)
Dess 1	5.5	L	L	L	13.61
F33	5.7	H	VH	M	7.70
F25	5.6	M-	M-	M	8.89
F97	6.0	M-	L	M	9.17
F11	5.9	M-	H	M	8.20
F32	5.8	M+	H	M	8.86
F5	5.6	L	H	M	12.83
F56/52	5.5	M-	M+	M	8.31
F48	5.4	L	L	M	8.17
F29	5.8	M-	H	M	7.34
Old 1	5.5	M-	H	M	9.97
Old 2	5.1	M+	H	M	10.34

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Soil Drainage, Compaction and the Available Remedies

One of the problems that Kincaraigie has in some of the fields is that of drainage and compaction. During the first meeting Gavin Elrick, Soil & Drainage Specialist, SAC Consulting, came along to dig in one of the fields to look at the soil profile and how compaction was affecting the area. Slurry is spread at least twice a year on some fields at Kincaraigie and host farm, Robert thinks this has contributed to compaction in some fields.

To look further into this there was a trial set up for the meeting which compared the use of an *Opico* sward lifter and a soil aerator (kindly supplied by G P Smart & Son) against no treatments at all. The trial was set up so that a section of the field where there were known drainage issues was treated with either of the options and then a trench was dug that intersected both treatments to allow us look at the differences that were made to the soil structure.

From the trench investigations, it was clear to see what each of the treatments had done to the soil, however, due to the extraordinarily dry summer there were already many natural cracks within the soil. The extraordinary long dry spell had naturally broken up the compaction and good root structure with the crop's deep hair roots could be clearly seen. Gavin explained that the line of compaction was visible and showed where water would have historically sat in the soil and affected drainage but that natural cracking had remedied this throughout the summer.

The difference between the sward lifter and aerator were seen and Robert has since been observing the areas to see if there is a difference in yields and improved grassland production. He believes that the sward lifter did a better job in the wetter, peaty ground since the slits it produces go deeper into the ground. However both the aerator and sward lifter look to have done a good job and made a difference in the lighter soils.

We will be revisiting these trial areas throughout the project because it will be interesting to see how they differ if there is another wet spell to test out the effectiveness of the sward lifter and aerator treatments.

Before trying any treatment at home, Gavin stressed the importance of taking a spade to dig a few soil pits to assess the soil structure. The depth of any compaction problems will dictate which machine will best suit to remedy any problems. As found at Kincaraigie, the sward lifter will work at a deeper level than the soil aerator and when used in the right conditions can create a wider reaching 'shatter' effect to break up the compacted layer. The soil aerator won't give the same shatter effect, but can be useful to create slits at a more superficial level and will help improve drainage and air movement for top level compaction.



Lime and Soil pH

- Scottish soils are naturally acidic and require lime to keep the at optimum pH and performing to their full potential. Test for soil pH regularly - no less than once every 5 years.
- Lime is not a nutrient taken up by the plant, but maintaining the optimum soil pH will ensure that plants can fully access soil nutrients.
- Liming material should be judged on their neutralising value, particle size and cost.
- Apply no more than 7.5t/ha in any single application.
- Maintaining an optimum pH improves plant nutrient uptake, increases soil microbial activity which can improve soil structure
- Lime can increase N losses to the atmosphere from slurry and urea applications.. If slurry/urea has been spread, leave at least a week before applying lime. Don't apply slurry/urea for 3 months following the application of lime.

Key Findings

- Check soil pH and nutrient status routinely — ideally at least once every 5 years.
- Apply lime and tailor fertiliser applications to work with soil results.
- The soils at Kincaraigie are very varied and due to a lot of organic manures used some have been found with high P and K status but low pH values.
- Testing the nutrient value of your slurry and FYM ensures applications are delivering the levels you *think* they are. This allows you to calculate the exact applications of artificial fertilisers required to meet crop requirements.
- A one method to treat all approach does not work with compaction issues. Assessment of the drainage problem and depth of compaction is essential to know before deciding on which course of action and/or which bit of kit should be used.