Glenkilrie Climate Change Focus Farm meeting

Visit to the SRUC Soil Aeration Event, Oatridge College Thursday 24th January 2013

Meeting Theme – Improving farm soils and drainage

As a change from meeting at Glenkilrie, farmer David Houstoun and the climate change focus farm group travelled to Oatridge SRUC campus, West Lothian to visit the Soil Aeration Event.

The group had time to look round the many stands including manufacturers of soil aeration equipment as well as other agricultural trade stands. Many experts in soil aeration were on hand to answer questions.

Presentations during the morning session were chaired by SRUCs Gavin Hill. He mentioned how relevant this day was due to the previous poor weather, plus problems with grassland from not producing enough forage to not having the ability for the grassland to carry the stock required. Gavin felt that since drainage grants were removed, the industry may have taken their eye off the ball and it was time to get drainage and other soil issues back to the fore. With an uncertain and changing climate, effective field drainage could become even more important.

The first speaker was Bruce Ball who is a senior researcher with SRUC. His expertise is in soil science, soil compaction, soil structure and conservation and visual analysis of soil structure. He began by reminding listeners to his talk, titled Restoring Waterlogged and Compacted Soils, how soil biology is important for good soil function, which in turn maintains

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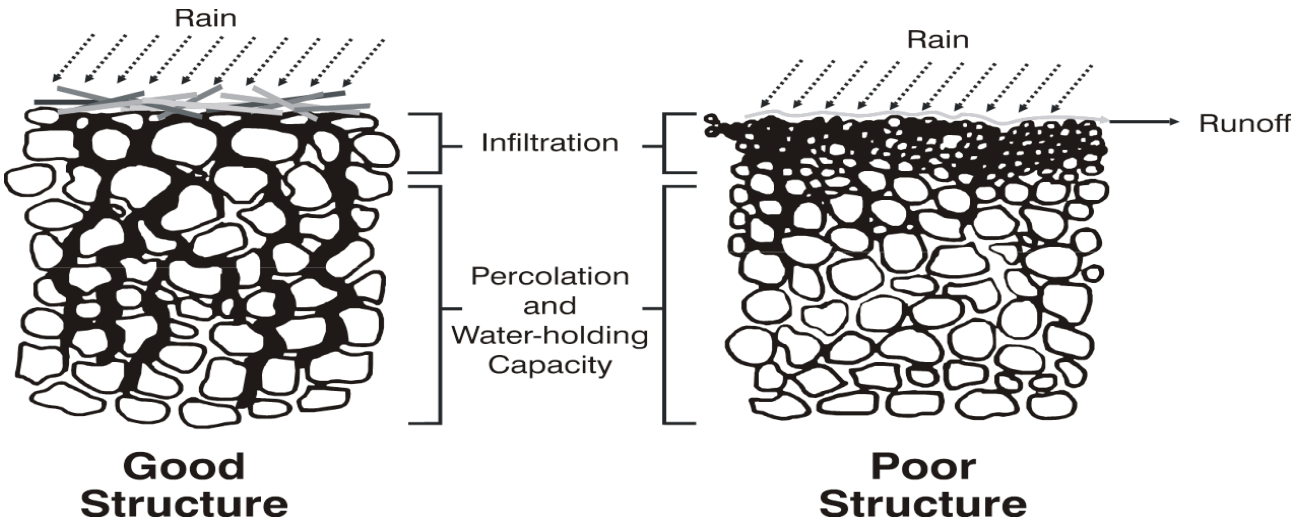
soil structure. He went on to explain good soil structure and poor structure as shown in the diagram:



The macro-pores and cracks allow for water infiltration and drainage, which keeps the soil aerated, increases water uptake and benefits crop yield. With the poor structure the ground becomes waterlogged much quicker.

Bruce went on to explain the importance of visual analysis of the soil. This will show if soil aeration is needed, or if it has been successful if soil aeration has been carried out. He went on to explain that soil structure problems are caused by waterlogging, compaction and poaching. The Assess your Soil Structure Practical Guide explains how to visually assess your soils – see www.sruc.ac.uk/downloads/120198/improve_farm_efficiency

Waterlogging

Waterlogging is often caused by compaction blocking macro-pores, so that some 'saturated' soil can be quite dry. As can be seen in the graph overleaf, waterlogging for 7 days causes the most Nitrous Oxide emissions (a powerful greenhouse gas implicated in climate change).

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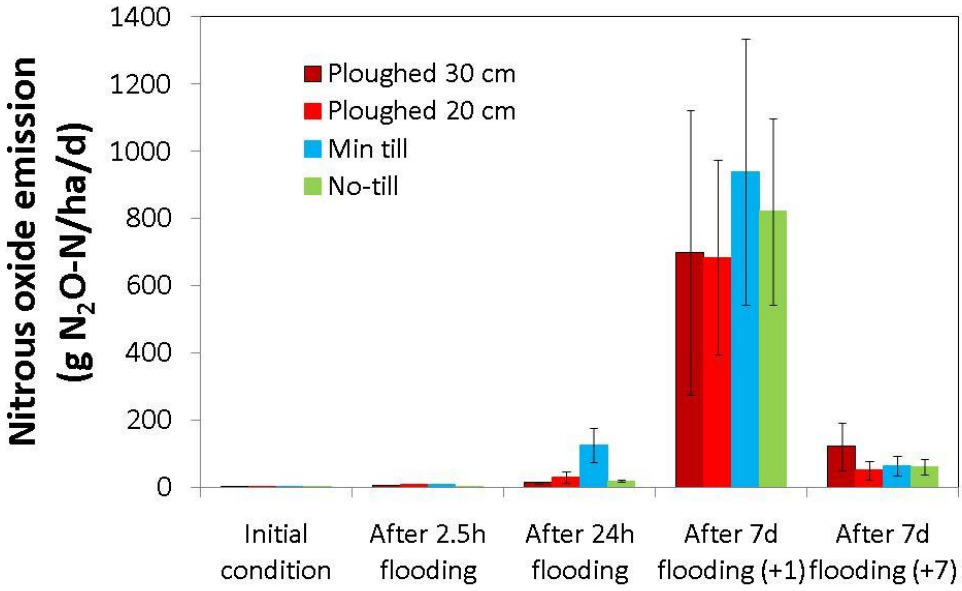

However these responses only occurred after fertiliser (120 kg/ha ammonium nitrate) was applied. Not only is this a greenhouse gas issue it is also a loss of nutrient (N) for the crop. Waterlogging long term prevents oxygen from reaching soil organisms and roots causing them to suffocate and available nutrients are lost. Available sulphate, manganese and iron are reduced in the soil producing dull grey/blue colours which can be seen in waterlogged soils.

Compacted soil

Compaction is shown by clods with large aggregates and sharp edges. Aggregates are platy or boxy and macro-porosity is low with few pores and cracks. Bruce went on to explain that in an experiment, for the 1st cut in particular, a significant reduction in dry matter yield of silage was produced in compacted soils. Compaction remediation increases rainfall infiltration and reduces runoff. Shallow slit or spike aerators are best for poached soils where compaction is shallow than for soils compacted by, say, grassland harvesting machinery where compaction is usually deeper and the subsoiler type aerator is better. For severe wheel rutting make fissures across the ruts (e.g. with tines to 30-35 cm), as this allows water to drain into the adjacent uncompacted soil.

To avoid compaction in the first place Bruce suggests that farmers should reduce weight of machinery, have more axles and reduce ground pressure by having wide tyres and using dual wheels. Bruce also has the following suggestions to reduce soil damage

- Check drains and ditches
- Improve drainage
- Align wet paddocks with lanes
- Cow tracks

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- Smaller cows
- Grasses with dense tillering
- On/off and strip grazing
- Fix compaction damage using aerators

Bruce finished off his presentation by mentioning that to prevent waterlogging and subsequently compaction and poaching that where possible you should keep off wet soil and check drains and ditches to improve drainage where possible. Improving this drainage might include capturing runoff upstream. Growing a crop where possible will enable the soil biological action.

Seamus Donnelly then spoke to the audience. Seamus is a senior consultant with SRUC in Stranraer and has a BSc in Soil Science. He started by making an SOS plea – Save Our Soils. Recently, of 1000 soils sampled, 27% were below pH 5.5 and 56% below pH 5.8. His advice was for everyone to go home and take a sample and find out what the status of their soils was. He queries whether a lot of the drainage problems were down to an increased volume of water – since 2010 the amount of water in some places has doubled – or if it is down to poor drainage? He mentioned that NFU is campaigning for drainage grants to be brought back.

Seamus went on to explain drainage in depth. If there is a permeable soil then no permeable backfill is necessary. Whereas, if there is poor downward drainage through the soil then a permeable backfill is required i.e. gravel.

If correct drainage was not in place, waterlogging would occur. He mentioned the problems of waterlogging. These included reduced crop yield, waste of fertiliser, reduced access to field and reduced optimum time for harvest without causing compaction. On the plus side good drainage allows for improved root growth, better crop and grass yields, better animal health – reduces risk of some parasites and diseases, less surface run-off (diffuse pollution), less soil damage, longer utilisation of fields and lessens risk of flooding (in towns).

The effect of poor drainage on yield can be seen in the table below

Ton/ha	**Freely Drained**	**Poorly Drained**
Potato	40	15
Bean	10	2
Carrot	40	5

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Seamus went on to mention how important it was to know how to recognise the signs of poor drainage. These included water lying on surface, roots are brown and shallow, mottled colours in subsoil and “sour” smell of the soil.

Seamus moved onto secondary drainage methods. He warned that these operations must be carried out with the correct equipment at the correct time.

For example subsoiling aims to loosen the soil and allow water to flow more freely through it—can also bust pans. It can be effective in soils of low clay content or stony soils where mole drains would not work. Subsoiling should be done only when necessary - check the subsoil for compaction and carry out when the subsoil is brittle i.e. not too dry or too wet. Post-harvest subsoiling is usually best in terms of land access and soil suitability (but not in 2007, 2008 or 2012).

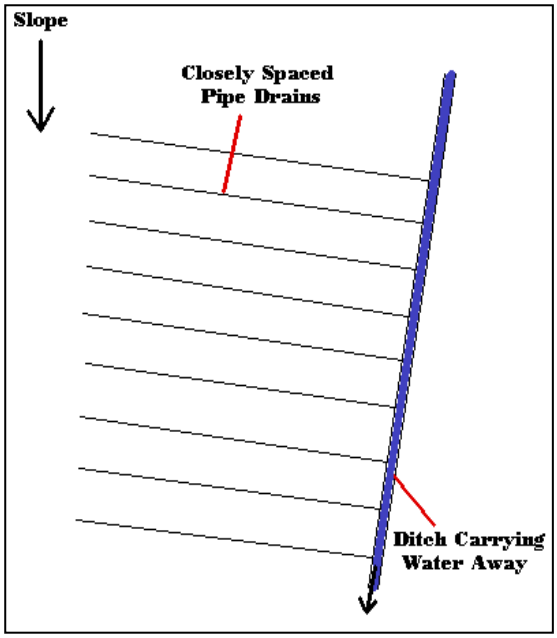
Seamus Donnelly came back to speak to the audience in the afternoon. This second presentation focussed more on putting the drainage into practice.

His first point was to always remember that water always takes the path of least resistance. He mentioned an important point before starting to do drainage. Speak to their father / grandfather and look at previous drainage maps. The chances are the drains were put there for a reason in the first place. Dig holes to look at existing drains- are they silted / rooted up / ochre / clear / under water? This will allow you to tell what the real problem is. Then the question is to decide whether maintenance of existing drainage is needed or a new system.

Drainage is expensive – prioritise areas to be drained and if there is no old system avoid it – there will be a reason why there is no existing drainage. Consideration should be given to collaboration with neighbours where possible to maximise benefits e.g. arterial burns/catchment.

He told the audience to design for required outcome and to allow for potential expansion at a later date. Seamus mentioned that drainage should be designed from the outfall back and ditches should be installed on boundaries where possible. They should minimise the requirement for culverts as there is potential for blockage in the future. And finally install correctly sized pipes and use gravel if necessary.

When on slopes drains must be laid **across** the slope to intercept water. Old drains that run down slope are ineffective. Where the soil is less permeable have closed drain spacings-15 - 20m is most common. Drains should lead directly into a ditch or large leader drain.



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Seamus went on to explain the benefits of using gravel; the drainage scheme will work better and last longer if gravel is used. It maintains an easy route to drain for water. It can be used to connect old systems to prevent putting in whole new system but it is expensive.

Seamus finished his presentation by mentioning the potential cost associated with drainage as per the table below:

	Backactor	Trenchless
15m Spacing	£2400/ac	£1500/acre
20m Spacing	£1600/ac	£1000/acre

SRUCs Iain Riddell closed the afternoon sessions and thanked Seamus and Bruce for their input into the day.

In addition to the machinery and trade stands, groups were also invited to take a look at some soil pits with SRUCs Grassland Researcher Paul Hargreaves. Paul demonstrated how to look for signs of soil problems such as compaction or anaerobic layers in the soil profile, discuss remediation techniques and to show how sward lifting had improved drainage at this particular site.

Paul said sward lifting at about 20cm can help to get air and structure into the soil and suggested that farmers should be looking to sward lift when it is dry but not too dry.

Do you farm and would you like to attend to future meetings?
The meetings provide sensible ideas for the farm business, from invited speakers and other farmers, to improve efficiency which in turn reduces emissions. It's free to come along and you will be able to influence the topics, speakers and location of future meetings.

Contact Peter Lindsay for details of the next Glenkilrie event at peter.lindsay@sac.co.uk or telephone SAC Consulting in the Perth office on 01738 636611.

If you want to keep up to speed with what's happening at Glenkilrie but don't want to attend all the meetings, ask to be added to the Glenkilrie email list; you will receive notification of future event and meeting notes.

Visit the website at www.farmingforabetterclimate.org or email a general enquiry to climatechange@sac.co.uk or follow us on Twitter @sacFarm4Climate

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