

Upper Nisbet Climate Change Focus Farm meeting



Discussion group meeting held at Upper Nisbet Farm on Thursday 6 December 2012 from 11.30 until 15.00 by kind permission of Robert and Jac Neill.

Meeting Theme – Improving farm productivity; Is the answer in the soil?

A wide range of soil structural problems can go unseen. If left unchecked these can have a significant impact on crop growth and productivity.

This meeting, chaired by Moira Gallagher (SAC Consulting, St Boswells) focussed on common soil issues and how to identify and rectify soil structural problems on farm, particularly those highlighted by the poor 2012 season.

Guest speakers were Bruce Ball, SRUC Soil Scientist & Tony Powell of Michelin UK.

Soil management

A healthy soil is made up of 45% mineral particles: sand, silt, clay, 5% organic matter including organisms, 25% water and 25% air.

Organic matter is crucial, particularly the organisms that are found within organic matter. 1 g of healthy soil contains around 1 billion micro-organisms which can be bacteria, protozoa, fungi nematodes, earthworms & arthropods. Soil microbes are important as they fix nitrogen, break down organic matter, recycle nutrients and suppress disease. To keep a soil healthy, good living conditions are needed for these organisms.

Texture and soil management

Hand texturing was demonstrated by Bruce by taking roughly a spoonful of soil, which was wetted up gradually and kneaded between finger and thumb, with enough moisture to show maximum stickiness. A flow diagram was then used to determine the soil type.

Texture, which cannot be changed, influences soil management in terms of soil water content, nutrient retention, erodibility, ease of cultivation, drainage suitability and soil structure. Sandy soils like those at Upper Nisbet have a high permeability but crops can be prone to drought.

Soil structure

This is the arrangement of particles and pores that allow:

- roots to anchor the plants;
- water to drain through cracks;
- water retention;
- air to roots for gas exchange;
- mineralisation of nutrients and release of crop roots;
- biodiversity of microbes.

Soil structural problems can lead to surface capping, anaerobic layers and compaction.



Soil compaction

Compaction is described as increased soil bulk density (compactness) and a decrease in porosity. This reduces drainage and water storage and increases the chances of ponding and run-off.



Compaction is due to applications of heavy loads, for example wheels and animals hooves, when the soil is wet, loose or weakly structured. Hence the importance of macropores and cracks within the soil structure, as they allow water to infiltrate and drain, keep the soil aerated reducing nitrous oxide loss by denitrification and increase water uptake of all plant nutrients, ultimately helping crops to achieve target yield. Compaction also influences mineralisation rates which are heavily dependent on microbial activity which is influenced by soil aeration and temperature.

Inspection pits (above) were dug in both arable (including tramlines) and grass fields to look at the effects the season had on soil structure.



Under the tramlines it was easy to see that the clods were large and boxy and macroporosity was low with few pores and cracks. The soil also had a bad smell to it and was grey in colour.



Spit of soil from grassland with good soil structure

Compaction restoration

A few key messages were given:

- Soil needs to be dry before remediation work is carried out, avoid traffic on wet soils.
- Build up soil organic matter by incorporating straw.
- Plough in good conditions.

Machinery options to minimise compaction

Two main options were discussed:

1. Reduce weight (effect subsoil compaction) – remove ballast and when not necessary, lighter machines, more axles.
2. Reduce ground pressure (affects topsoil) – wide tyres, dual wheels, tracker vehicles and specialised low ground pressure machines.

Livestock options

Measures can also be undertaken to avoid poaching and compaction:

1. Improve drainage.
2. Align wet paddocks with lanes
3. Smaller cows.
4. Grasses with dense tillering.
5. On/off and strip grazing.
6. Alleviate compaction damage using aerators.

Compaction remediation

Due to the difficult summer compaction has occurred in many fields. There are a number of ways that this can be alleviated but firstly, the location and depth of the compaction must be determined by digging a small inspection pit. Action to remediate of compacted soils will depend on the type of compaction found:

1. Surface layer compaction

The aim here with remedial work is to re-open the macropores. The soil aggregates should be displaced sufficiently so as they don't return to their original position after subsequent traffic. Remember also that if soil is physically broken up, it can become far more susceptible to compaction than re-compaction after subsoiling.

2. Severe wheel rutting after harvest

Make fissures across the ruts (e.g. with tines to 30-35 cm). The aim of this action is to allow water to drain into the adjacent, uncompacted soil.

3. Subsurface compacted layers (pans)

Make fissures through the layer with minimal break-up and soil re-arrangement. This will keep the support capacity of the compacted layer while creating pathways for drainage and root movement through to the rootable layer below.

Soil types & minimum tillage

The drier and more stable structured a soil, then the greater the chances of success and mitigation of climate change with minimum tillage.

Both direct drilling and minimum tillage (5-15 cm depth) are likely to succeed on freely drained soils. Minimum tillage is possible on other soils but great care in soil management is needed on clay soils and where drainage is poor due to likely seedbed problems and waterlogging.

Tony Powell set up a demonstration to illustrate the pressure beneath a tyre and it was easy to see how soil compaction can occur. The depth to which compaction occurs when tyres with 12 psi and a wheel load of 1,650 lbs are used on dry, moist and wet soils varied from 40 – 60 cm.

Another demonstration illustrated how correctly inflated low ground pressure type can reduce compaction and as a consequence surface run-off and sediment loss; keeping valuable soils and nutrients on the farm.

Summary

Key points from the meeting included

- Working with poor soil structure costs you money.
- Top soil is alive – care for it, every time you drive over it think of the cost.
- Remember the subsoil.
- Min-till could help to protect soils but it is not suitable for all sites.
- Correctly inflated low ground pressure tyres reduce compaction.

Moira thanked the group and speakers for their input. Further information was provided at the meeting, including the Farming for a Better Climate practical guides available at:

http://www.sruc.ac.uk/downloads/120198/improve_farm_efficiency

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 whilst reducing the loss of greenhouse gases. It's free to come along and you will be able to influence the topics, speakers and location of future meetings.

Contact SACs Moira Gallagher for details of the next Upper Nisbet event at moira.gallagher@sac.co.uk or telephone the SAC St Boswells office on 01835 823322.

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

Visit the website at www.farmingforabetterclimate.org or email climatechange@sac.co.uk

