FIELD LAB: CULTIVATING SOIL HEALTH
Field lab report: November 2017

The Cultivating Soil Health field lab started in 2016 at Newmiln farm, Perthshire, courtesy of Hugh Grierson Organic. It investigated if reduced tillage methods can improve soil health, reduce production costs and improve the farm's carbon footprint. More information is available on the Soil Association Scotland website.

Meeting at Durie Farms, 7 November 2017

Doug Christie from Durie Farms attended all the soil health field Lab meetings in 2016, and this year offered to host an event at his own farm to share his minimum tillage methods and discuss soil health principles within his system. We were joined by Dr Bruce Ball from SRUC who is a soils specialist whose work has included looking at minimum tillage cultivation.

Durie farm is one third organic beef/arable, and two thirds non-organic stock-free arable (230 Ha). Since Doug stopped ploughing his non organic land about 17 years ago, he has seen a huge improvement in his soil health, indicated by:

- increased worm numbers (30-40 earthworms in a 30cm^3)
- increased organic matter
- improved water infiltration rates
- increased bird life
- Increased aggregate ability of soil (see Slake test below)

He has seen how much more resilient his soils are and he *partly* attributes this to increased glomalin (the glue that holds soil particles together which is produced by mycorrhizal fungi). Mycorrhizal fungi are very susceptible to damage through *cultivations*. At the meeting we carried out a Slake test of 3 different soil samples to demonstrate the difference in soil aggregate water stability between ploughed soils and no till systems.

Slake Test

Sample 1 – neighbour's arable ploughed field

Sample 2 – organic grass/arable rotation

Sample 3 – Direct drilled arable field

Principles for soil health:

1. **Minimise soil disturbance**
2. **Soil armour – never have bare soil**
3. **Maintain living roots in the soil – cover crops**
4. **Diversity of crops and rotation**
5. **Integrate livestock (where possible)**

Minimum Tillage Methods

Doug was at first attracted to a minimum tillage system because it requires less labour, fuel and power in establishing the crops in a more timely fashion. His motive is also to try to keep as much carbon in the soil as possible which brings a range of numerous other benefits. His philosophy and methods were reinforced by such advocates of Conservation Agriculture as Jay Fuhrer (USDA NRCS), Kris Nicols (Rodale Institute), Gabe Brown (Farmer) and Frederic Thomas (Farmer) to name a few.

Direct drilling and intercropping examples

Doug has experimented with intercropping over the last three years, including:

- Spring Oats with Spring Beans
- Spring Barley with Spring Beans
- Vetch and Spring Oilseed Rape
- Spring Barley and Peas

A considerable amount of over-wintered cover crops have been used over the last 10 years. Some of the more resilient cover crops mixtures grown have been:

- Linseed and spring beans
- Oats and spring beans
- Oats and mustard

Mixtures sown are based on what cash crop will succeed the cover crop. Winter Rye has been successful only when there has not been a wet autumn as the crop is very attractive to slugs. Most of the other examples above are not as prone to slug damage. Where possible, and dependent on the price, the farm has applied green waste compost (bought from the local council) prior to sowing at 15t/ha. This is applied without any cultivations prior to drilling.

Challenges

Doug has said that Glyphosate is the achilles heel of the system, but he believes that using a small amount of herbicide is better than ploughing, based on the evidence on his own farm. He has greatly reduced his chemical use, stopped using insecticides and seed dressing in most scenarios, and has not found that herbicide in small quantities has an obvious detrimental impact on earthworm populations. He believes there is huge scope for further reducing particularly artificial fertiliser and fungicide use without compromising yield.

Funding for this activity is made available through the SRDP Knowledge Transfer and Innovation Fund (which is jointly funded by the Scottish Government and the European Union), with partner funding from Quality Meat Scotland, Forestry Commission Scotland, Innovative Farmers and The Prince of Wales's Charitable Foundation.