

Soil Association Scotland
Soil Carbon Seminar
25 February 2010

Dr Julia Cooper: Key messages from presentation

- Soil Carbon Sequestration is a win-win scenario
 - It promotes good agricultural sustainability
 - It mitigates GHG emissions through removing carbon and storing it in the soil
 - It improves soil structure and soil fertility – enhanced water holding, reduces fertiliser use etc.
- Quality or type of carbon added into the system is more important than the quantity e.g. (manure and clover ley higher than soya)
- The farming system has an impact on carbon sequestration. Research has shown that biodynamic systems capture most carbon with less inputs of carbon
- Composting encourages carbon storage. Should consider how to encourage composting and in particular the practice of composting farmyard manure

To encourage carbon sequestration will need an evidence based system around which financial rewards can be based. There is a need to develop systems which measure field by field SOC levels versus an optimum SOC. To bring this in will need baseline measurements, either through modelling or based on a local measurement system. From this can reward land managers who reach optimum levels.

Aligned to this there will need to be proactive utilisation of stewardship programmes to encourage land managers to adopt practices which sequester carbon. These could build in direct measures and rewards for perceived C sequestration.

Other factors to consider:

- Trace gas emissions – do increases in SOC affect CH₄ and N₂O emissions?
- Redistribution of C – this is not sequestration. Importing C from elsewhere to build up C in soil is not sequestration. Importing material may have a carbon footprint.
- Soil carbon cannot be considered as an isolated entity. It's important to have links with other initiatives. Will have benefits for water cycle if can minimise run off etc.
- Must balance food security with emissions reductions. Reduced livestock will reduce emissions but just transfer the issue if do not change diet as may increase food miles and dependence on imported food.

Peter Melchett: Key messages from presentation

The UK Government's Chief Scientist's 'perfect storm' of rising demand for food, feeding the hungry and climate change "...requires changes in the way food is produced, stored, processed, distributed and accessed that are as radical as those that occurred during the 18th-19th century industrial and agricultural revolutions and the 20th century Green Revolution. Increases in production will have an important part to play, but they will be constrained as never before by the finite resources provided by the earth's lands, oceans and atmosphere."

The Soil Association vision for farming in 2050 is one in which farming has a secure future through:

- Climate and agricultural friendly farming linked with healthy diets and/
- Farming doing more than other industries to cut GHG emissions by storing carbon in the soil.

In considering the role which soil carbon can play in climate friendly farming and a future proof farming system, we need to consider it within the context of the following assumptions:

- UK 80% target for emissions reductions across all sectors will remain or rise to 90% before 2050 given science and the decision to allow air travel to make no overall cuts
- Agriculture can exceed the 80% target which will be set for all sectors
- Agricultural land in the UK will continue to be used for food production (for humans – not animals) and be less reliant on inputs
- The UK and world population continues to grow
- There would need to be significant changes to current diets in line with WHO and UK health departments' policies
- There would need to be globally large reductions of grain fed meat and dairy
- Farming will face increasing scarcity and higher prices of key inputs
- Rain and rain-fed irrigation main source of water; Phosphates and Nitrates will continue to be available from renewable sources but mined phosphates and fossil fuel based nitrogen will become increasingly expensive

Drivers for change

The price of fertiliser inputs and energy costs will drive reforms towards climate-friendly farming, linked directly to the business outputs. Alongside this market demand

can drive a need for systems change e.g. dietary change, public expectations of farming i.e. openness of actual production and welfare standards for animals.

Farming is very important to the economy in Scotland and Wales and policy agendas are closer in these nations. Both will drive change in farming practices.

Soil Carbon has a direct role in managing the impact of climate change. Soil carbon accounts for around one tenth of all CO₂ emitted since 1850. Unlike fossil fuels, the carbon lost from the soil can be sequestered – so carbon loss is reversible, though it's important to note that the timescales for so doing can be very long.

Tiny increases in soil carbon levels (<1%/year) will result in removal of millions of tonnes of carbon C at a national level (>bn tC globally).

And crucially, agriculture is the key player - as it accounts for most soil carbon losses, yet there is the capacity to reverse this and sequester carbon.

The role of Organic Farming

There is now solid evidence that organic farming produces higher soil carbon levels than non-organic farming (around +28% in Northern Europe). This translates into significant levels of carbon sequestration, though the data for Scottish soils is far from solid.

Organic farming does this because:

- It is based on inputs of organic matter to the soil and its decomposition by microbial activity
- This releases nutrients for crops **and** produces humus
- Organic farming raises soil C levels:
 - supply of additional organic matter sources (eg. grass leys)
 - use of forms of organic matter that are more effective
 - integration of crop and livestock systems
 - greater level of vegetation cover (eg. green cover crops)

Organic farming produces these benefits as a by-product, without taking land out of food production, while also delivering multiple benefits, namely reduced pesticide use, increased animal welfare, increased biodiversity, etc.

Summary of Discussion

Q. Can you comment on what land use (agriculture/forestry/pasture etc.) gives the best balance of agricultural output and carbon sequestration?

A: The Forestry Commission has set a target of 25% on uplands which reflects the carbon sequestration offered by trees. But a diversity of approach is needed. Trees are needed for building materials and fuels as well as their role in carbon sequestration.

Tree planting is not the only issue. De-stocking changes the vegetation regime and hence the pattern of sequestration. It's not just about forestry.

Q: If the Forestry Commission is to achieve this target will need to consider where new woodland would be planted. Surely this should not go on organic soil as will lose more carbon than would sequester in the trees.

A: The jury is out – there is no hard evidence around natural regeneration and its carbon input. If looking at a big win, should perhaps keep organic soils organic and look for savings in other categories. For example Pete Smith has done a report which showed that if soil were to release less than 1% soil carbon would double GHG emissions. This report acknowledges the value of the soil carbon we have in our soils and the impact they can have.

Comment: To date there has been a lot of work on the merits/dis-benefits of forestry on peats. But need to consider the type of peat land. If planted on an active peaty bog – i.e. one which is not heather dominated – the trees planted would not increase carbon capture. But shallow peats with heather would give a different picture. The IUCN Peatland programme about to publish a report and a commission of enquiry moving forward on this.

Discussion: In Scotland, arable farming is spatially less important, and soil carbon levels are naturally higher in soil organic matter than other areas of the UK. There is a higher starting point so it is harder to achieve a high % increase. Scottish soils have a higher equilibrium value of soil carbon and because of this there is a limit to where the increase can go. In summary, there are limits to soil C sequestration based upon factors such as climate and texture and we do not have figures for the maximum theoretical C sequestration potential for Scotland's arable soils.

Q. Green wastes can be used to create bio-fuels – but this means the carbon is not going back into the soil. Are there other ways of recycling organic matter back into the soil? For example, the anaerobic digestion of green wastes gives a different balance of natural product.

A. With regard to residues use we do need to look at it on a case by case basis. Bio-char is interesting and presents opportunities, getting rid of rhododendron via utilising as a green waste is also potentially useful. Therefore it depends on the situation. Essentially food versus fuel is not the best debate to be having.

Q. What didn't tackle in presentation was a changing climatic situation. Where people want to grow will be a different place to where people currently grow. Have you looked at where competition of land use will influence?

A. Not sure, we cannot model this since we do not know what the impact will be as cannot predict the climate impacts.

Q. When you say Organic Farming increases Carbon sequestration – will this hold under the new climate models?

A. Whilst speculating at how a system is going to respond is difficult at this stage due to the range of uncertainties in the new climate models we do know that organic systems are more robust. They use varieties which are more resistant since are scavenging for nutrients (root systems better formed). The soils have better structure, and higher organic matter contents are better at holding water. Organic systems are also more diversified and hence resilient. In Scotland, we have a more diverse agriculture than in England, and a culture of adaptation.

Comment: Systems are very important but we also need to understand the components within the systems to understand them as will manipulate the components. We need to understand the lessons from Organic Farming which can be brought into conventional farming.

Comment: This is a key moment when something could be done. A substantial amount of public money is going into these systems. We need to consider how these are best used. Single Farm Payments in themselves are a large sum and could be used to drive these multiple objectives. The Pack Report in Scotland briefly mentions biodiversity but its emphasis is that support needs to be linked to production. The public and environmental benefits are not linked into the argument strongly enough.

Comment: Agriculture is one use of land. We do need to balance our need to produce food with competing demands on land and ensure multiple benefits for land use.

Q. We do need to go back to basics and look at soils in Scotland and what their capacity is: there is a limit in some soils. If we are trying to claim GHG savings from some systems, we need hard figures.

The national inventory covers certain categories but doesn't do what you are proposing in this area. How are you proposing to measure carbon?

A. We had this discussion with biodiversity in organic farming. We had some historical data around birds. We had no data on individual farms and vaguely knew the different species and what we needed to do around this.

If we could measure it precisely we would sell it on the market. There is a need to derive reliable data for the C sequestration potential for different soils and land use scenarios in Scotland. To derive a figure for organic farming we need to combine field data with known rates of organic matter accumulation.

Attendees:

Name	Org
Patricia Bruneau	SNH
Karen Dobbie	SEPA
Keith Geddes	SNH
Cilfton Bain	RSPB Scotland
Graham Kerr	SAC
Allan Lilly	MLURI
Duncan McLaren	FoES
Courtney Peyton	Thirdwave
Geeta Puri	Scottish Government
Drew Ratter	Crofters' Commission
Bob Rees	SAC
Sally Thomas	Scottish Government
Rachel Tulloch	Scottish Government
Christine Watson	SAC
Dr Julia Cooper	Nafferton Ecological Farming Group
Hugh Raven	Soil Association
Peter Melchett	Soil Association
Eleanor Logan	Soil Association