Global carbon pools

- ocean pool is the largest at 38.4 trillion metric tonnes (t)
- fossil fuels (4.13 trillion tonnes),
- soils (2.5 trillion t to a depth of one metre),
- biotic (620 billion tonnes)
- atmospheric pools (800 billion tonnes).

Carbon concentration in the atmosphere is increasing at the rate of about 2 parts per million (ppm) per year, with transfer primarily from the fossil fuel and soil pools. The UK is legally committed to reducing carbon emissions by 80% by 2050 in order to help stabilise atmospheric carbon dioxde at 450ppm. Organisations like www.350.org argue for a precautionary 350ppm (we are presently at 387 ppm).

Britain's “wildwood” existed for about 7000 years, from the post-Ice Age warm-up right through mediaeval times, when it was said a squirrel could cross England without touching ground. The soils of these natural forests contained around 10% organic matter but since clearance to make way for agriculture this has reduced to an average of 3.5% and in some intensively farmed arable land is just 1%. This decline is ongoing through the long-term use of extractive farming processes.

One solution is to transfer atmospheric CO2 into soils and plants; this is called carbon sequestration. The potential of carbon sequestration is higher in degraded soils. The technical potential of carbon sequestration in world soils may be 3 billion tonnes per year for the next 50 years – the equivalent to a draw-down of about 50ppm of atmospheric CO2 by 2100.

Climate Friendly Food Community Interest Company

Climate Friendly Food is a not-for-profit social enterprise with charitable aims registration no. 6815026 offering services to farmers, growers, market gardeners, community supported agriculture and urban food growing projects.

- UK's most comprehensive free online carbon calculator for farm businesses
- Participatory certification with farmer-to-farmer inspection
- Directory for consumers
- Lots of useful information about resilient food systems and moving away from fossil fuels

www.climatefriendlyfood.org.uk

Acknowledgements

Statistics taken from Professor Ratten Lal's International Food Policy Research Institute briefing for Copenhagen – *The potential for soil carbon sequestration*
www.ifpri.org/sites/default/files/publications/focus16_05.pdf

Sink stores and soils - conserving land based carbon, The National Trust Wales, 58 James Street, Cardiff Bay, Cardiff CF10 5EZ, policy&campaigns@nationaltrust.org

Carbon sequestration from rich soil farming

Climate Friendly Food

Low carbon food from rich soil farming

www.climatefriendlyfood.org.uk

Carbon Calculator · Participatory Certification · Education

Rich-soil farming

Increasing the organic matter and humus levels in the soil has many benefits:

- mitigates climate change by absorbing anthropogenic carbon emissions;
- enhances soil quality;
- improves our environment, especially the quality of natural water courses;
- improves crop yields and strengthens food security

.

Healthy soil = healthy plants = healthy animals and people

Plants form a “carbon highway” from atmosphere to soil with four stages:

- *Photosynthesis* where plant leaves use the sun’s energy to absorb carbon dioxide and separate the carbon and oxygen to form sugars;
- *Resynthesis* occurs inside the plant where the sugars are transformed into more stable carbon compounds;
- *Exudation* and the release of organic matter happens when plants exude carbon into the soil through their roots, and when leaf, stem and root matter enters the soil;
- *Humification* takes place when soil microbes decompose plant-carbon into more stable forms (humus).

All farmland employs the first three stages, but the use of artificial nitrogen (without returning organic material), deep ploughing and regular tillage fails to maintain the fourth stage, the soil microbial life. It is the microbes that make the humus, storing carbon in the soil and preventing it re-oxidising to the atmosphere. Humus also provides nutrition to plants and like a sponge, holds on to the water content of the soil.

Examples of rich-soil farming

- crop rotations with deep rooting green manures
- compost, biochar and chipped branch wood soil enrichment;
- reduced-tillage cultivation systems that leave residues and avoid deep tillage;
- reduced summer fallows and bare soils;
- crop mixes to include more plants that are perennial or have deep-root systems
- shift land use from annual crops to perennial crops;
- restore degraded soils, especially those affected by accelerated erosion, salinization and nutrient depletion.

Vetch fixes nitrogen, covers bare soil and improves soil structure

Case study - Barton Farm is a 350 acre farm with rich Devon red soil, that has been fully organic since 2002. In the last year they have switched their arable cultivation system to a very minimum cultivation based on the research of Friederik Wenz, in Germany and Organic Arable in the UK. The system uses white clovers instead of red which is easier to incorporate. The concept is to cultivate only 2”of soil and leave the soil life undisturbed below this. Also on the farm 30 acres, including four polytunnels, are dedicated to growing organic vegetables for a box scheme, part of this - half an acre outdoor and indoor polytunnels are zero tillage.

Biochar potential

Been defined as a fine-grained, highly porous charcoal that helps soils retain nutrients and water, resulting in increased soil fertility for agriculture. The carbon in biochar resists degradation and can sequester carbon in soils for hundreds to thousands of years.
For more information visit:

UK Biochar Research Centre - http://www.geos.ed.ac.uk/sccs/biochar

Products and biochar kilns available from - www.carbon-gold.com

CFF does not advocate the chopping down of forests for biochar but can see the carbon benefits of linking it to energy coppice from perennial plants (see the briefing sheet *Carbon sequestration from plants*.)

Peatland (histastols)

One particularly important and unique soil carbon pool is in peatlands. Peat is formed when plant material in marshy areas is kept from decaying by anaerobic and acidic conditions. Draining and burning peatlands is a significant source of CO2 emissions. Restoration of wetlands and avoiding cultivation of peatland can convert these soils from a large source to a vast carbon sink. Drained and cultivated peat lands decompose and subside at the rate of 1 to 2 centimetres per year.

Soil sampling for CFF calculator

The CFF carbon calculator includes changes to soil organic matter (SOM) levels on the farm. We strongly advise farmers and growers to take annual SOM analysis. Carbon sequestration increases with the rate of SOM increases.
Please see our separate “soil sampling” briefing for further information.