Update on Soil C&N Module work

Pete Smith

Royal Society-Wolfson Professor of Soils & Global Change, FIBiol, FRSE
Institute of Biological & Environmental Sciences,
School of Biological Sciences,
University of Aberdeen,
Scotland, UK
E-mail: pete.smith@abdn.ac.uk

JULES Meeting – Exeter, June 2009
Ongoing projects developing the JULES soil C & N module

• Using JULES-Soil C&N coupled code
  – Defra [CEOSA0804] soil threats project (with David Cooper, CEH)
  – CEH CHESS project (PhD with Eleanor Blyth & Bridget Emmett, CEH)
  – JULES for croplands (with Chris Jones & Spencer Liddicoat, Hadley Centre)
  – QESM Methane project (with Doug Clark, CEH)
  – CEH Bio-energy projects (with Jon Finch, CEH)
  – IMOGEN runs (with Chris Huntingford, CEH)

• Using stand-alone Soil C&N module
  – Scottish Government, RERAD NSIS2 project
  – Welsh Assembly Government, ECOSSE-2 project
  – Defra [CEOSA0804] soil threats project (see also above)
  – Defra [SP0567] soil organic carbon project
  – NitroEurope / CCTAME / Carbo-Extreme (croplands only)
  – NNFCC project on bio-energy crops in the UK
  – QUEST Soils upland / peatland model comparison
Running with inventory data for Scotland

Simulated changes in soil carbon (kt C 20km² (10 years)^{-1})

-100.00
-99.99 - -40.00
-39.99 - -20.00
-19.99 - -10.00
-9.99 - -0.10
-0.09 - 0.10
0.11 - 10.00
10.01 - 20.00
20.01 - 40.00
40.01 - 100.00
> 100.00

J.U Smith et al., 2009
...and for England & Wales

Hillier et al., 2009
Tested against catchment scale data in Wales

Nayak et al., 2009
Comparison with National GHG Inventory

Change in soil C across Scotland (kt C yr⁻¹)

- to arable
- to grassland
- to forestry
- to semi-natural

Gain in soil C

Loss of soil C

J.U Smith et al., 2008
Simulated soil carbon (0-95cm) at NSIS site with land use change semi-natural to forestry

Extrapolation of results over the 160 years using long term average weather data.

- Minimal disturbance, net increase in soil C after 15 years.

- If soil is disturbed, net increase in soil C after 140 years.

- This emphasises the importance of practices to minimise soil disturbance

J.U Smith et al., 2009
Assessing the impacts of energy crops

"Emissions savings" of model arable farms introducing SRC - including SOC emissions

"Emissions savings" of model livestock farms introducing SRC - including SOC emissions

Gottschalk et al., 2009