

"Ecosystem Land-Use Modelling & Soil C GHG Flux Trial (ELUM)"

Abstract

The aim of the ELUM project was to develop a user-friendly modelling tool from which the impacts of bioenergy land-use change on soil carbon (C) and field greenhouse gas (GHG) balance could be explored spatially across the UK. The modelling tool outputs were derived from the well-established ECOSSE soil carbon and GHG model.

An essential aspect of developing this model was the availability of data for model parameterisation and validation. A network of 6 sites were established across the UK to assess these processes underpinning GHG balance; seventy-four paired sites have also been sampled to measure the soil C changes from conventional crops (arable and grassland) to selected bioenergy crops (*Miscanthus*, short rotation coppice-willow and short rotation forestry).

The site-specific modelling showed that the ECOSSE model was extremely accurate in predicting soil carbon for land-use change from conventional crops (arable and grassland) to Willow, *Miscanthus* and short-rotation forestry, to a soil depth of 1 m.

At the site level, there were good correlations between each measured GHG flux and the modelled values. Results for soil CO₂ emissions from bioenergy and conventional crops showed good correlations with the modelled values, with an average correlation coefficient of 0.6 across sites and measurement types. Correlation coefficients for N₂O and CH₄ ranged from 0.05 to 0.61. Although these correlations were lower than for soil carbon stocks and CO₂ emissions, the model outputs were still within experimental error.

The outputs from the detailed ECOSSE process-based model were then extracted to compile a user-friendly meta-model which provided spatially explicit, high-resolution information on the impacts of land-use change for bioenergy in the UK. Outputs will be shown.

Brief biography

After obtaining a PhD in 2010 at the Trinity College of Dublin with a thesis on the potential of bioenergy crop *Miscanthus* to sequester carbon in the soil, Marta Dondini joined the Environmental Modelling Group at the University of Aberdeen as a Post-doctoral Researcher. Her main research interests involve investigating how carbon storage in soils will be altered by land use change to bioenergy plantations and in partitioning soil into fractionations that match theoretical pools in soil C models. Her main areas of expertise are in modelling greenhouse gas / carbon mitigation and mechanisms regulating soil carbon sequestration. She is a scientific reviewer for *Global Change Biology*, *Global Change Biology Bioenergy*, *Plant and Soil*, *Geoderma* and *European Journal of Soil Science*.