Soil C change and GHG emissions after land use change to bioenergy crops

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Current process-based models of bioenergy crop growth have only recently begun to include descriptions of soil C change and GHG emissions. These models can be used to explore the interactions between bioenergy crop type, soil type, climate and crop management, to determine likely soil C change and GHG emissions under present and future climate. While such models have been developed and improved against a range of soil C and GHG experimental datasets, few of these originate from the 2nd generation bioenergy crop.

In this study, the soil process-based model ECOSSE has been used to simulate soil C change and GHG emissions arising from bioenergy crop land use change. The model has been run using the driving data collected at several sites in UK and Ireland, and soil C change and GHG emissions have been tested against measurements. The implications of previous land use and the time since the energy crops were established have been simulated. The model has been then run for a transition matrix of previous land uses, assuming the following previous land uses: cropland, semi-natural grassland, improved grassland and woodland. Finally, the soil C change and GHG budget of each potential transition at each site have been addressed. The use of detailed driving variables at these well characterised sites form a sound basis for a further application of the model at larger spatial scales.