

Net ecosystem exchange from five land-use transitions to bioenergy crops from four locations across the UK – The Ecosystem Land Use Modelling & Soil Carbon GHG Flux Trial (ELUM) project.

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A major part of international agreements on combating climate change is the conversion from a fossil fuel economy to a low carbon economy. Bioenergy crops have been proposed as a way to improve energy security while reducing CO₂ emissions to help mitigate the effects of climate change. However, the impact of land-use change from a traditional land use (e.g., arable and grassland) to bioenergy cropping systems on greenhouse gas balance (GHG) and carbon stocks are poorly quantified at this time.

The Ecosystem Land Use Modelling & Soil Carbon GHG Flux Trial (ELUM) project was commissioned and funded by the Energy Technologies Institute (ETI) to provide scientific evidence within the UK on a range of land-use conversions (LUC) to bioenergy crops. The ELUM network consists of seven partners investigating five LUCs in four locations including Scotland, Wales, North and South England. Transitions included grasslands to short rotation forestry (SRF), to short rotation coppice willow (SRC) and to Miscanthus and arable to SRC and Miscanthus

Measurements of net ecosystem exchange (NEE) along with continuous measurements of meteorological conditions were made at seven sub-sites over a two-year period. Results showed that, over two years, two of the land-uses, a grassland in South England and a grassland conversion to Miscanthus in Wales were net sources of carbon. The greatest carbon sink was into the SRF site in Scotland followed by the SRC willow in South England. The annual terrestrial ecosystem respiration (TER) for the SRC willow in North and South Sussex sites were similar, but the annual GPP at the South England site was about 27% higher than that the North England site.

Establishing a long term network will allow us to continue monitoring the effects of land use change on whole ecosystem carbon balance, providing an insight into which types of LUC are suitable for bioenergy cropping in the UK.