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First results from the UK network to establish the greenhouse gas balance of land conversion to second generation bioenergy willow, Miscanthus and short rotation forestry

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ELUM is UK consortium project with 7 partners, funded by a joint incentive of public and private investment from the Energies Technology Institute (ETI). The aim of this project is to assess the impact of land conversion to second generation non-food bioenergy crops on greenhouse gas balance for several land use transitions, including from arable and grassland. A network of 6 sites has been established across the UK to assess these processes underpinning GHG balance and to provide input data to a meta-model that will be used as a tool to assess the sustainability of our land use transitions. The planned outputs of this project include an assessment of our current understanding of land use change and bioenergy cropping systems, the addition of greenhouse gas (GHG) data to national inventories and development of novel technologies to monitor GHG.

Here we focus on the results of the soil GHG flux data (CO_2, N_2O and CH_4) which are being collected at 5 sites and transitions, gaining good spatial coverage of the UK including Scotland, Wales, northern and southern England. These sites cover the following transitions: grassland to short rotation forestry, grassland to Miscanthus, arable to short rotation coppice (SRC) willow, arable to Miscanthus and grassland to SRC willow. A year of data capturing has been collected at these sites revealing the seasonal variability with increased CO_2 fluxes, representing total soil respiration, in the summer months, irrespective of site. The importance of non-CO_2 GHGs is also being considered and monthly measurements of CH_4 and N_2O using static chambers, provide no evidence that these gases contribute significantly to the overall carbon footprint of the bioenergy crops, in contrast to recent reports on SRC poplar. There were, however, some occasional large unexplained fluxes in these gases suggesting they may play a lesser part in some bioenergy cropping systems and are more complicated to evaluate.

As well as this experiment, data will be presented on an investigation into the difference in soil GHG fluxes under different genotypes of Miscanthus. The preliminary results of this experiment show that although there are differences in the genotype fluxes on a monthly basis over a year, there are no significant trends in the flux data that can help identify which genotype emits the most/least soil CO_2. This will require further investigation into phenotypic differences as well as environmental variables which could be affecting the fluxes before one species can be chosen over another for cultivation for bioenergy and carbon sequestration.

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