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Comparing net ecosystem carbon dioxide exchange at adjacent commercial bioenergy and conventional cropping systems in Lincolnshire, United Kingdom

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The conversion of agricultural land to bioenergy plantations represents one option in the national and global effort to reduce greenhouse gas emissions whilst meeting future energy demand. Despite an increase in the area of (e.g. perennial) bioenergy crops in the United Kingdom and elsewhere, the biophysical and biogeochemical impacts of large scale conversion of arable and other land cover types to bioenergy cropping systems remain poorly characterised and uncertain.

Here, the results of four years of eddy covariance (EC) flux measurements of net ecosystem CO_2 exchange (NEE) obtained at a commercial farm in Lincolnshire, United Kingdom (UK) are reported. CO_2 flux measurements are presented and compared for arable crops (winter wheat, oilseed rape, spring barely) and plantations of the perennial biofuel crops Miscanthus x. giganteus (C4) and short rotation coppice (SRC) willow (Salix sp.,C3). Ecosystem light and temperature response functions were used to analyse and compare temporal trends and spatial variations in NEE across the three land covers. All three crops were net in situ sinks for atmospheric CO_2 but were characterised by large temporal and between site variability in NEE. Environmental and biological controls driving the spatial and temporal variations in CO_2 exchange processes, as well as the influences of land management, will be analysed and discussed.