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Effects of crop residue on carbon dioxide, methane and nitrous oxide emissions on cultivated peat soils

Samuel Musarika[1,2], Davey Jones[2], Dave Chadwick[2], Niall McNamara[3], and Chris Evans[1]
[1]UK Centre for Ecology & Hydrology, Bangor, United Kingdom of Great Britain and Northern Ireland (smusarika@ceh.ac.uk)
[2]Bangor University, Bangor, United Kingdom of Great Britain and Northern Ireland
[3]UK Centre for Ecology & Hydrology, Lancaster, United Kingdom of Great Britain and Northern Ireland

Peatlands cover three percent of the global land surface. However, they store significant amounts of carbon (C), approximately 30%. Peatlands are drained to support agricultural production. It's estimated that agriculture exploits approximately 20% of peatlands worldwide. The exploited peatlands are significant emitters of carbon dioxide (CO_2) and nitrous oxide (N_2O). In Europe, agriculture is the second largest contributor of greenhouse gas (GHG) emissions. In addition to GHG emissions, we are fast losing productive peatlands; it's estimated by 2050, a third of productive peatlands will be lost. Loss of productive peatlands will affect productivity and food security.

To prolong use of peatlands, ploughing in of crop residue, either from the previous season or specially grown crop, is often considered a mitigation option. Nevertheless, there is concern that fresh organic matter (FOM) might accelerate decomposition of existing organic. This study assesses effects of FOM on the emissions of CO_2, methane (CH_4) and N_2O in a cultivated peatland. A mesocosm experiment was carried out using intact cores with added FOM and manipulated water table (WT), -20 and -50 cm.

The results show there is an effect of both WT and FOM on emissions. CO_2, CH_4, and N_2O emissions differ in the different WT treatments. The -20 cm cores produced more methane than the -50 cm. It is evident that leaving crop residue and then ploughing it in does not have the desired effect as it led to increased emissions.