



Assessing the impacts of the establishment of *Miscanthus* on soil organic carbon on two contrasting land-use types in Ireland using soil fractionation

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In recent years the use of biomass for energy production has become an increasingly important measure for mitigating global change. However, the scientific debate has been inconclusive with regard to the risks and benefits of bioenergy use. There is particular concern that land-use change to bioenergy production can lead to increased CO₂ emissions. These emissions result from the loss of vegetation and the soil disturbance. The use of perennial crops such as *Miscanthus x giganteus* as a feedstock for bioenergy production offers a possible solution, as it shows a large soil carbon (C) sequestration potential across Europe. The aim of the present study was to analyse the impacts of land-use change from arable farming and grasslands to *Miscanthus* on soil fractions and associated soil organic carbon (SOC). Four three to four year old commercial *Miscanthus* sites, as well as adjacent control sites representing the former land-use, in SE Ireland were analysed for changes in SOC stocks and newly sequestered *Miscanthus*-derived C. The soil samples were fractionated using a combination of physical and chemical methods. The fraction with which the SOC is associated significantly influenced its decomposability and turnover time. Using the ¹³C natural abundance method, we found that newly sequestered C was found mainly as particulate organic matter (79.7% of *Miscanthus*-derived C) and therefore in a labile state with short turnover times. No significant differences were found in the distribution of the different soil fractions and SOC between the *Miscanthus* and the control sites, and it was shown that the share of fractions on the bulk soil as well as the proportion of the SOC associated with these fractions in young *Miscanthus* sites depends mainly on the previous land-use. It was therefore concluded that soil disturbance linked to the introduction of *Miscanthus* does not lead to a significant loss of soil organic carbon or a disruption of stable aggregates.