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**Uncertainty analysis of soil organic carbon stock change in Canadian cropland from 1991 to 2001.** *Global Change Biology* (in press)

### **Abstract**

National estimates of changes in the amount of soil organic carbon (SOC) in cropland requires an assessment of uncertainty for accounting and reporting under the United Nations Framework on Climate Change (UNFCCC) and the Kyoto Protocol. Canada has datasets on SOC stocks in croplands, historical changes in SOC levels due to management practices, and historical changes in the area of land devoted to certain soil management practices. We conducted an analysis of uncertainty of the change in SOC levels due to management practices in Canada from 1991 to 2001 using Monte Carlo analysis and a simple model. Probability distribution functions were determined for each of the inputs of the model, enabling us to assess the uncertainty for the output. The storage rate of SOC in cropland soils of Canada for the ten year period ranged from 3.2 to 8.3 Mt C yr<sup>-1</sup> at 95% confidence, with a mean of 5.7 Mt C yr<sup>-1</sup>. Approximately 67% (about 3.8 Mt C yr<sup>-1</sup>) of the increase in SOC storage in Canada occurred in Saskatchewan where the cropland area under no-till increased from 10% to 35%, and the area of summer-fallow declined from 43% to 20% during the study period. The large uncertainty in the effect of no-till on SOC stock changes in the Gray-Brown Luvisols of Ontario contributed most to the variance in the model output. If trends in agricultural management continue for the next 10 year census period, the estimated SOC storage would comprise between 7 and 19% of the gap required to achieve the 6% reduction in 1990 greenhouse gas emission levels for Canada under the Kyoto Protocol.