



Impact of 40 years of poplar cultivation on soil quality and soil greenhouse gas fluxes

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In the frame of the “JRC Kyoto Experiment”, greenhouse gas fluxes (CO₂, CH₄, N₂O) from soils in Parco Ticino (near Pavia, Italy) were monitored for two years. This area, characterized in the past by the presence of natural deciduous forest, was largely converted into poplar plantations and arable land, as for example rice paddies, which, after maize, is the most important crop in the Po valley region. In order to assess the impact of the land use change, a pedological study was carried out contemporaneously with soil greenhouse gas flux measurements at a poplar site and a natural forest, Bosco Negri, which represents the pristine land cover of the area. Here, the pedological study has shown the presence of soils with a well developed organic layer. Greenhouse gases were measured below canopy with soil flux chambers. Results show that the pristine forest has small emissions of N₂O and that soil respiration rates of the two ecosystems are in the same order of magnitude despite the fact that carbon stocks in Bosco Negri are much higher than at the poplar site. At the poplar site, we observed the absence of a litter layer and a depletion of the carbon content in the A-horizon. Nitrogen stocks are depleted as well, but to a lesser degree leading to a C/N ratio of about 12.5. In Bosco Negri, soils exhibited a C/N ratio of about 15 (A horizon). The lower C/N ratio at the poplar site is indicative of a higher turnover rate of organic material. For the poplar site only, the greenhouse gas balance has been completed with above-canopy CO₂ flux measurements using the eddy covariance technique. The results indicate that soil N₂O emissions accounted for about 3% of the net CO₂ uptake by photosynthesis while CH₄ fluxes were negligible. The paper will present results in detail and discuss how special events like the flooding of the area (November 2002) or the drought during 2003 affected these two ecosystems.