The soil water content was determined by oven-drying at 105 °C to constant weight (w/w, %). A combination glass electrode was used to determine pH of 1:1 soil-water extracts. Organic C and total N (TN) were measured by combustion in a Fisons NA1500 elemental analyzer (ThermoQuest Italia, Italy). Soil C mass was calculated by multiplying soil organic C concentration and bulk density.

Organic C functional groups were measured for soil humic acid and littler by 13C NMR spectroscopy. Freeze-dried soil humic acid samples were placed in a sample tube (7 mm diameter) to determine the soil chemical-shift composition using 13C NMR spectroscopy (BRUKER DSX 400 MHz solid-state NMR, Germany).

LPI-C and LPII-C were quantified using a total organic C analyzer (Model 1010, O.I. Analytical, TX), while RP-C was measured similarly to the soil organic C using an elemental analyzer.