



Soil organic carbon and biological fertility in a Mediterranean forest area (Italy)

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The study was performed at Castelporziano Estate, a natural ecosystem with high environmental value, and not concerned with any direct sources of pollution. However, it is situated near the city of Rome, some industrial plants, the international airport of Fiumicino, and some highways that can represent an external source of pollutants. Castelporziano lies in Central Italy at the western outskirts of Rome, about 20 km from the city centre and in front of the Tyrrhenian Sea.

Soil morphology is mainly plain (30 m mean elevation) with sandy materials of alluvial nature, and only the inner part is formed of volcanic and alluvial materials with a slight elevation above the sea level (85 m). The total area is about 6000 ha, the climate is Mediterranean, total rainfall is 700 mm, and mean temperatures range from 4 °C in winter and 30 °C in summer. The vegetation is typically Mediterranean, mainly oaks, mixed broadleaf groves, and Mediterranean maquis along the seacoast. Areas with reforestation of pines, as well as corkwoods, pastures, and small agricultural fields are also present.

Soils were sampled at five different sites:

- QI, forest of *Quercus ilex* L.;
- MM, Mediterranean maquis;
- PP, *Pinus pinea* L. reforestation (60 years old);
- MF, mixed hygrophilous back-dune forest;
- AR, arable land.

Five soil samples from each site were collected (0-20 cm of depth), about 2 m far from each other. Soil organic carbon (SOC), total N (N_{tot}), microbial biomass carbon (C_{mic}), basal and cumulative respiration (C_{bas} and C_{cum}), the metabolic quotient ($q\text{CO}_2$), and the mineralisation quotient (qM) were determined. The index of biological fertility (IBF), a comprehensive indicator considering SOM, C_{bas}, C_{cum}, C_{mic}, $q\text{CO}_2$ and qM was also calculated for the different land uses. Five intervals of values have been set for each parameter, and a score increasing from 1 to 5 has been assigned to each interval; the algebraic sum of the score for each parameter gives the classes of biological fertility.