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Impact of an intensive management on soil biochemical and biological properties in an agricultural soil of Southern Italy

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An intensive management of agricultural soils is widely carried out to increase vegetation productivity. Nevertheless, the large use of machineries, chemical fertilizers and pesticides can often cause, in time, a substantial decline in soil fertility by affecting soil physical and chemical properties and, in turn, growth and activity of soil microbial community. In fact, alteration in soil structure, nutrient losses and, in particular, changes in quality and quantity of soil organic matter are some of the principal soil degradation processes deriving from an intensive agricultural management that can affect, in different ways, soil biochemical and biological properties.
The aim of this research was to assess the impact of intensive management on agricultural soils by measuring soil physical, chemical and biochemical/biological properties. The use of appropriate indicators as quantitative tools could allow to assess soil quality. Moreover, although soil physical and chemical properties have received great attention, soil biochemical/biological properties, such as enzyme activities and microbial biomass, functionally related properties involved in the nutrient cycles, can be considered as sensitive indicators of soil quality and health changes because, they show a faster turn over compared to soil organic matter.
Our attention was focused on the Plane of Sele river (Campania region, Italy), an area characterized by an intensive agriculture and greenhouse cultures. Twenty-five farms were chosen, with the aid of regional soil map, in order to get soils with different physical and chemical properties. As common trait, the selected farms, all with greenhouse cultures, used no organic amendments but only mineral compounds to fertilize soils. Moreover, to better understand the impact of intensive agricultural practices on soil of each farm, control soils from orchards or uncultivated plots were chosen.
In each farm soil samples were collected in three different plots within a greenhouse or within a field, for control soils. Every sample was formed by 5 sub-samples collected in 5 different points following a W scheme in the plot. All samples, sieved at 2 mm mesh, were stored at 4 °C and characterized by analysing the following soil physical and chemical, properties: soil texture, bulk density, water content, water holding capacity, pH, cation exchange capacity, organic carbon, total nitrogen, phosphorus, potassium, sodium, lime, and electrical conductivity were determined. Moreover the activity of dehydrogenase, beta-glucosidase, urease, phosphatase, and arilsulphatase, the enzymes involved in the biogeochemical cycles of carbon, nitrogen, phosphorous and sulphur, respectively, as well as microbial biomass C were measured. Results of this study seem to indicate that a great variability exists among the farms. A clear evidence is that the control samples, not subjected to intensive farming, always showed better values of chemical properties and higher values of enzymatic activity and microbial biomass to indicate a negative effect of intensive agriculture practices on soil quality and fertility in studied areas. Data confirm that enzymatic activities and microbial biomass can be considered valid and sensitive indicators of soil quality.