

Comparison of Carbon Stock and Biological Soil Quality in Organic and Conventional Agriculture within Ombrone Plain

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Abstract

Climate change and the progressive biodiversity losses represent two of the main challenges for the future of our planet. Agriculture can play an essential role in both sectors, for several reasons. More than 11% of continental surfaces are used for agriculture, and agroecosystems can act as source or as sink of carbon. Furthermore, soils, and the agricultural soils, hold a large amount of earth biodiversity. The productive structure, the agricultural regimen and the level of inputs can determine very important differences in soil quality and in the biodiversity of the agroecosystem. The adoption of organic farming and low-input farming can reduce the impact of agricultural activity on biodiversity. These types of agriculture are increasing in Europe, and the organic farming area and the low input farming area reached respectively in Europe 4% in 2007 and 28% in 2000 of the total agricultural area. With the aim to evaluate the effects of organic farming and of different landuse/crop rotation/agronomic management schemes on Mediterranean soils, an experimental trial was carried out in the Ombrone alluvial plain. As part of this research, the capacity of soil to store carbon and the structure of soil mesofauna, as a response of different agricultural pressures, were investigated.

The study area is represented by Alberese farm and by the surrounding area within the Ombrone alluvial plain. Alberese farm has a surface of 4600 ha, situated on the Ombrone alluvial plain (Tuscany – Italy) and on the reliefs of Promontorio dell'Uccellina. The farm adopted the organic farming system since the 2002 for all cultivation, excepting vineyards and the plant nursery. Croplands represent 69 % of the farm area, and the remaining 31 % is represented by Mediterranean forest and macchia, pasture, wetlands, and coastal areas. The main crops/land use are pasture, durum wheat (0.67 %) and meadow (7.5 %).

In order to compare the conventional and the organic farming system, two herbaceous crops (durum wheat and sunflower) and the olive tree plantations have been sampled. The evaluation of farming intensity within the organic system was evaluated, including in the sampling schemes for meadow, pasture, and forested pasture.

The organic carbon content in the soil was evaluated by collecting core samples with stainless steel cylinders at the following depths: 0-10, 10-30, and 30-50 cm. The same samples were used for determination of bulk density and organic carbon content, using the Walkley-Black method.

Samples for determination of Biological Soil Quality (QBS) were collected, undisturbed, at a depth of 0-10 cm. Description of the QBS method can be found in Parisi et al. (2001).

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