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IMPACT OF PERENNIAL ENERGY CROPS ON CHEMICAL QUALITY AND MICROBIAL COMMUNITY OF SOIL IN THE PO VALLEY

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Abstract

Energy crops are designed for biomass production to generate bioenergy. Their recent introduction in the Po Valley (North Italy) is connected to the mitigation of environmental effects of the intensive management. Intensive management has a dramatic impact on the soil ecosystem of the area, reducing soil organic matter, degrading soil structure and altering nutrient cycles by reducing microbial biomass, and thus compromising soil productivity. Soil organic carbon (SOC) content in the Emilia-Romagna region is the lowest in the Po Valley (<1%). The introduction of energy crops in the Po Valley is one of the possible solutions to mitigate the loss of soil carbon and its fertility, caused by intensive management. In this research we compare a 10-year crop system of three perennial energy crops: *Miscanthus x giganteus* (miscanthus), *Panicum virgatum* (switchgrass) and *Arundo donax* (giant reed), with a 10-year crop system of traditional annual crops: *Triticum spp.* and rotation *Zea mays* / *Triticum spp.*. This long-term experiment is carried out in Cadriano farm of University of Bologna and includes a no-fertilized (N0) and a N-fertilized (N1, 120 Kg ha^{-1}) treatment. Our aim is to determine the impact of biomass crop cultivation on chemical soil quality and microbiological function, compared to a traditional crop system. Particularly, we are studying if this long-term management system could improve soil carbon sequestration (*carbon sink* function) and consequently its effect on soil microbial communities composition and their biological role in nutrient cycling. As perennial energy crops have a deeper roots distribution than annual crops through the soil profile, soils are sampled to sections of 0-15, 15-30, 30-60 and 60-90 cm. Preliminary results on chemical soil quality suggest that, after 10-years of energy crops growing, SOC and total nitrogen (TN) are significantly higher than in the annual system, through the soil profile. We can observe a similar trend for microbial biomass carbon (MBC) and nitrogen (MBN). Consequently, we expect differences between the two management systems in specific microbial groups and their community structure, associated to an increase of enzymatic activity. If the impact of energy crop cultivation in the Po Valley on soil quality and soil biota will be positive, we could state that this new management can be an effective sustainable alternative at environmental level in this climatic area.