

SoilCare MSc / PhD Research Information

Research Title

Impact of soil covering and tillage on soil physical-chemical quality

Abstract

The combination of simplified cropping systems, intensive tillage, high traffic load and reduced organic matter inputs has led to a reduction in Soil Organic Carbon (SOC) and to a deterioration of soil structure. As consequence, greenhouse gasses emissions and soil compaction have increased. This reduction in soil quality resulted in a decrease of the input use efficiency, along with a rise in energy consumption, higher nutrient loss and more risk of soil erosion.

Conservation agriculture (CA) has been addressed as a possible solution to mitigate the negative effects of intensive tillage and simplified cropping systems. Two of the main pillars of CA are no tillage and permanent soil covering. Even if CA is considered an effective remedy to soil compaction and SOC loss, in many cases opposite effect was registered. First adoption of CA management in Veneto Region silty soils, showed that, despite an increment of SOC in the top 5 cm, topsoil compaction is increased.

Natural poor aggregate stability and low SOC content seemed to prevent the exploitation of CA-related ecosystem benefits with a negative effect also on crop yields.

Objectives of the research

The objective of this research is to evaluate the impact of different soil coverings, combined with different tillage intensities on soil physical-chemical quality. The study will focus on the effect of two different soil covering (horseradish vs bare soil), managed with different tillage management strategies (conventional tillage vs no tillage). Conservation agriculture guidelines include the application of a crop rotation, but to better evaluate the effect of soil covering and tillage, a maize monoculture will be implemented.

SoilCare study site

The experimentation will take place in two fields, located in Legnaro, Italy, at Azienda Agraria Lucio Toniolo, with two replications. Each field is managed with no tillage (NT) or conventional tillage (CT) system. A maize monoculture (*Zea mays* L.) will be performed, while three different soil coverings will be established in each sub-plot during the winter season: bare soil vs horseradish (*Raphanus sativus* L.) vs. winter wheat. The bare soil is considered as the business as usual treatments, while the two cover crops are intended as a way for controlling, at least partly, nutrient loss and loosening soil compaction – the horseradish - and to efficiently control nutrient loss, without affecting in a substantial way soil physics – the winter wheat.

A series of physical and chemical analyses will be performed every year following both the main crop and the cover crop with the aim to evaluate the variations in soil physical-chemical qualities. Physical analyses will be: infiltration measurement, penetration resistance and bulk density at different depths. Chemical analyses will be: texture, organic carbon, mineral nitrogen, available phosphorus, exchangeable cations and soil organic carbon at different depths.

Partners in this research

None

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