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Does tillage influence physical- and chemical- related soil quality indicators equally?

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Soil degradation is linked with a loss of land′s actual or potential productivity. This process is a result of natural and anthropogenic action being soil tillage one of the main drivers of the last. As a result, soil quality, which manifests soil′s capacity to produce ecosystem services and goods, can be compromised. There are several indicators traditionally measured to characterize soil quality, either based on soil physical or chemical properties. Among soil physical properties, water flow features, as expressed through the soil water retention curve, are directly linked to the distribution of soil pores and can be useful to derive different indices (such as the S index) to evaluate soil′s quality. Organic matter, nutrients, and cation exchange capacity are also soil chemical properties affecting soil quality.

The main aim of this study was to evaluate the methodology based on the S index (Dexter, 2004) and selected soil (chemical and physical) properties at the short term under typical Mediterranean agricultural conditions. For this reason, physical and chemical soil properties were measured in a short-term trial settle in two olive orchards under different soil managements: tillage and cover crop and at two depths: surface (0-10 cm) and depth (10-20 cm). In addition, water retention curves; water storage capacity; and soil porosity were characterized.

At the two studied sites, changes in soil management, even after a short period of time, had a quick effect in chemical properties. However, soil′s pore size distribution, as quantified with the S index, did not show remarkable differences after changing soil management. This may be a consequence of the longer-term effect of changing soil management on water retention and transmission. Future research including more soil types and assessing water-flow-related properties over a longer time interval, may well provide clearer results in the assessment of soil quality.

Dexter, A.R. Soil physical quality. Part I. Theory, effects of soil texture, density, and organic matter, and effects on root growth. Geoderma 2014, 120(2004), 201–214