

Effect of rock fragments on soil physical properties at pore and field scales

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Many soils in Mediterranean area contain high amounts of rock fragments as a result of both natural soil forming processes and human activities. Coarse rock fragments have a controversial role in soils. They are often included as a limiting factor in most Land Evaluation and Land Capability schemes throughout the world, but they also protect against soil erosion and soil physical degradation. Some experiments have showed also that, because of the beneficial effect in reducing bulk density and increasing macroporosity in topsoils, field crushing of stones could be considered a better agricultural practice than removing stones from soils.

Although many experimental studies have only focused on the effect of (superficial) rock fragments on hydrological properties, direct measurements using soil image analysis allowed to improve the knowledge of the mechanisms of pore formation due to the presence of rock fragments inside the soil profile.

In this work, a lab experimental test with two different soils susceptible to compaction was performed. The soils were added with different concentrations of rock fragments and subjected to several wetting/drying cycles, in order to induce formation of soil structure; then hydrological measurement and soil image analysis were performed. The measured changes in soil pore system and hydro-dispersive properties have been following implemented in simulation models in order to predict the effect of such results at field scale on yields of different crops in variable climatic conditions.

Therefore, the aim of this work was to evaluate the effect at different scales (pore vs sample vs field) of rock fragment addition on many processes combining hydrological measurements with soil image analysis and modelling.

The obtained results showed the usefulness of the use of image analysis to enhance the parameterization of the hydrological models and allowed to observe the role of different soil types in affecting the effect of rock fragment addition at different scales.