

Managing soil compaction and enhancing soil physical health
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Abstract

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Soils are the most critical life-supporting compartments of the biosphere. They provide numerous ecosystem services such as habitat for biodiversity, water and nutrients, as well as producing food, feed, fiber and energy. Soils undergo intense and irreversible changes due to a non-site adjusted land management and improper application of machinery and techniques in its broadest sense. In combination with the growing population (until 2050 we will have approx. 9 Billion people) the urgent need for a more reliable dataset of soil properties and soil functions gains in importance in order to even prepare more reliable models for various requests. The mechanical strength – the precompression stress - as the result of geo-, pedo- and anthropogenic long-term processes - can be defined as the basis for quantifying the rigidity boundary. It distinguishes between the recompression stress (i.e. elastic, rigid properties) and the virgin compression stress range where plastic deformation including irreversible changes of properties and functions occur. The changes in the hydraulic or pneumatic functions like hydraulic or air conductivity, the pore size distribution primarily all occur in the virgin compression stress range, The same is also true for redox reactions and the biological activity (respiration) in soils but also carbon sequestration potential is also linked with the precompression stress value. Thus, physical soil health is strongly linked to a more precise definition and following of site-specific functionality differences, which may exclude or concentrate on certain land use or management forms, in order to optimize yield, soil protection and a sustainable land use management considering the limited site specific resilience at the same moment.