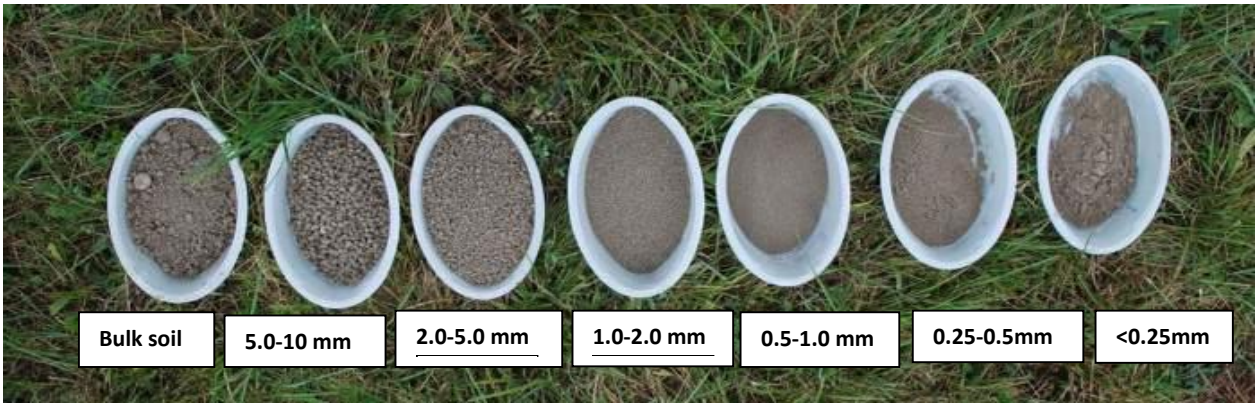
Soil Transformation of European Catchments (SoilTrEC)- Project Fact Sheet (www.soiltec.eu)

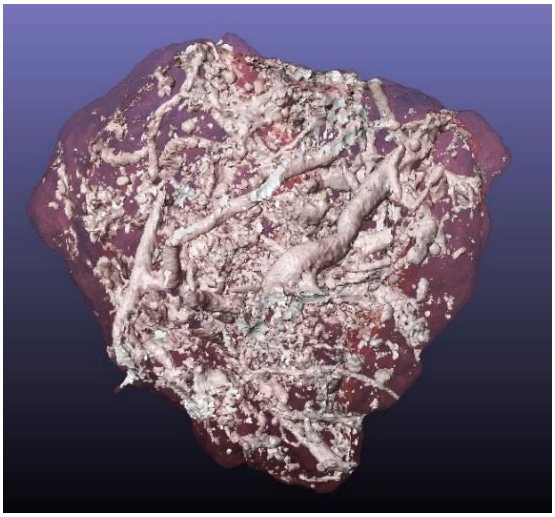
Rejuvenating Soil Structure

What is a soil aggregate?

Soil is fundamentally made of single solid particles and these particles stick together to form aggregates. Soil Aggregates are fundamental building blocks of the soil structure. The size of aggregates ranges from a fraction of millimetre to several millimetres of different soil sized aggregates as shown in the photograph below. Depending on the land use and other environmental factors, soils will have different proportion of various sized aggregates. The amount of stable aggregates in a soil is an important property or characteristic that determines many soil functions.



Why they are important? Aggregates control almost all soil processes and are vital for many soil functions. Aggregates contain a lot of pores which are important for storage and movement of air and water. The image on the right shows a 3D view into the complex network of pores within a soil aggregate (~5 mm diameter). The pores are given in white within the aggregate body (brown). Soil aggregates are reservoirs of organic carbon and other nutrients in soils. Plant roots utilize the water held in soil aggregates. Aggregates are also home for microbial organisms in soil which play a vital role in releasing nutrients from the soil organic matter.



How aggregates are formed in soil? The formation of aggregates starts where organic carbon chemically binds with metals and clay or silt particles. Some other elements such as iron and calcium are found to be involved in the formation of aggregates. Roots and other organisms

such as earthworks help in the formation of aggregates. In addition to this, in some cases, wetting and drying of soils has been found to be a major factor in soil aggregate formation**.** Soil structure and stability of aggregates will decline without additional organic amendments in soils. Once the soil structure is lost, it will take decades or centuries to bring the soil to original function state. We need to manage soil structure with maximum care!

How stable are they? Stability of aggregates is one of key parameters determining the quality of soil aggregates. It is a measure of strength of aggregates to withstand external forces such as water erosion. The amount of aggregates that remain stable in water (or water stable aggregates) is an important indicator of soil structure and quality. For a better soil structure, we need to increase the amount of water stable aggregates. The photograph here shows a laboratory testing procedure to test the aggregate stability.

How Does Soil Management Practices Affect Soil Structure?

The SoilTrEC project revealed that the effect on improving soil structure will depend on the soil tillage practices. For example, in improved (managed) grasslands where tillage is minimum, organic farming practices have improved the stability of the soil aggregates compared to conventional farming methods. A cultivated cropland where a lot tillage is involved, will require a lot more organic amendments and fertilizers to improve the soil structure compared to a minimum or no-tilled system.
We also found that a combination of compost and manure are found to be the best combination for improving soil structure and better yield.

How Does Land Use Affect Soil Structure?

Results from the SoilTrEC project showed that arable soils have lost almost all of its water stable aggregates due to continuous tillage practices and lack of organic matter whereas grassland or forest soils have high proportion of water stable aggregates. This is one of the main reasons for increased erosion found in arable landscapes.
We also observed the abundance of microbial communities to be drastically reduced. These microbes play vital role in organic matter decomposition and nutrient cycling in soils. Rapid growing grasses can improve the soil structure rapidly as it adds a lot of organic carbon into soil through their root systems. They may be included in short-term crop rotations.

For more information visit SoilTrEC website: www.soiltrec.eu

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