Agriculture Is Life

Increase in Soil Macroporosity managed with Winter Ploughing

A preliminary results of the project: Soil infrastructure evolution and its effect on water transfer processes under contrasted tillage systems

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Introduction

Investigation of hydrodynamics of soil water in a field scale is a promising approach to characterize the differences in soil porosity , soil water flow pattern and soil infrastructure evolution under different land management.

Reduced Tillage

Roots, earthworm, organic matter

Mechanical modification of soil structure

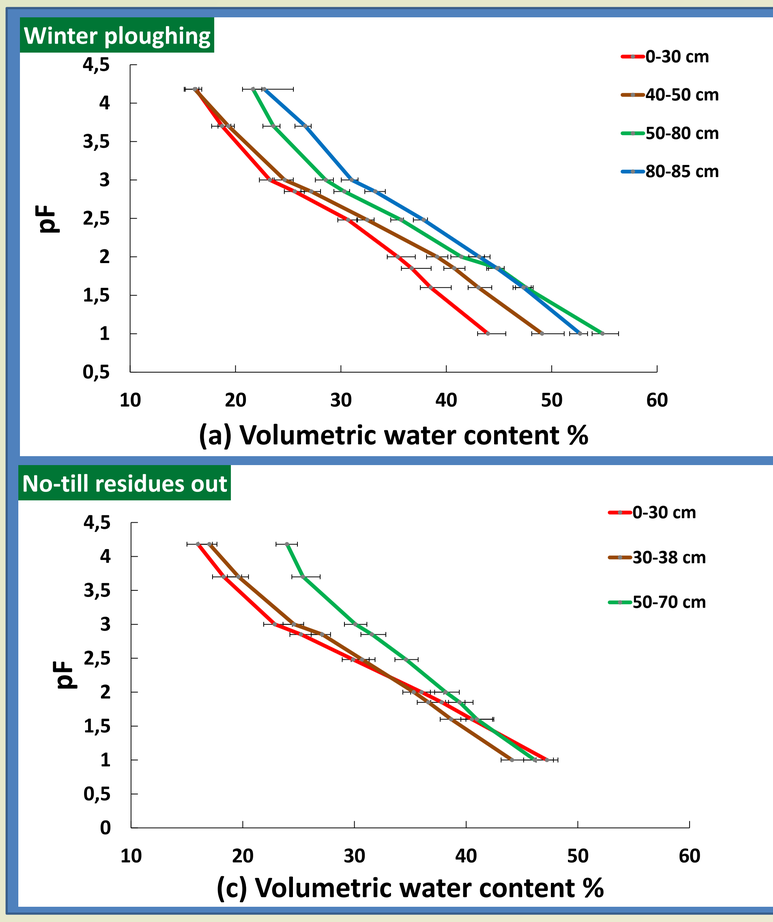
Changes in soil architecture/soil physical properties especially soil hydrodynamic processes; also changes in Soil biology and soil chemistry

Aim of the project

We aim at investigating the **effect of soil tillage** along with **residue management** on **soil structure** at aggregate scale or more specifically at pedon scale.

Findings of soil moisture retention capacity by the conventional pressure plate technique

Undisturbed soil samples were saturated in water by upward capillary flow and then placed in Richards pressure plate at 9.8 to 14710 hPa. The pressure was increased at 9 different state untill the equilibrium has reached. The volume of water release by the pores was calculated by taking the weight of the samples in each pressure head.



Results show **significantly (p<0.05) higher water retention** (Hwr) in Winter ploughing than Strip tillage at 9.8 to 98 hPa, Hwr in Winter ploughing than No-till residues in at 39 to 14710 hPa, Hwr in Strip tillage than No-till residues in at 294 to 14710 hPa and Hwr in Winter ploughing than No-till residues out at 69 to 98 hPa. No significant difference in the water retention between No-till residues out and in and Strip tillage and No-till residues out.

Materials and methods

Experimentation will be on 'Solresidus' and 'Solcouvert' experimentations in Gembloux, Belgium. Four different practices; **'No tillage with organic matter restitution'** versus **'No tillage without organic matter restitution'** in the plots of 'Solresidus' and **'strip-till'** versus **'winter ploughing'** in the plots of 'Solcouvert'. The experimentation has been started from June 2013; all the experiment will be repeated twice a year.

Figure.1. Measurement soil water retention and hydraulic conductivity

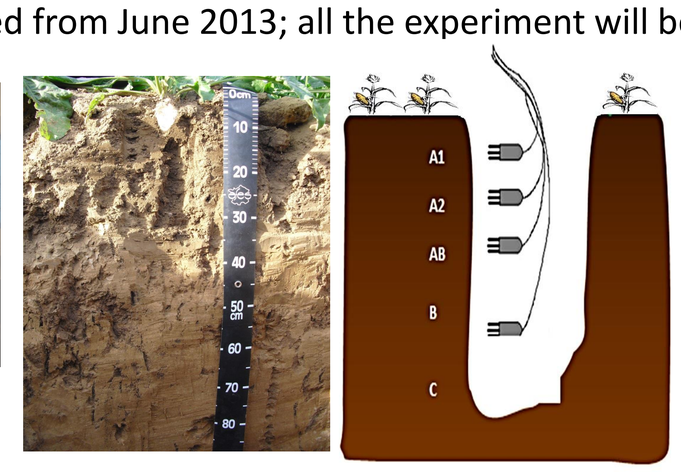


Figure 2. Soil pits observation and set up Soil moisture sensors

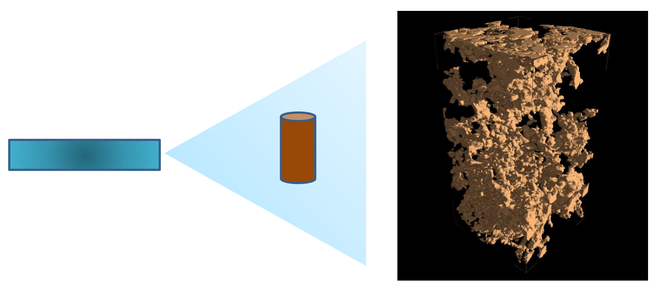
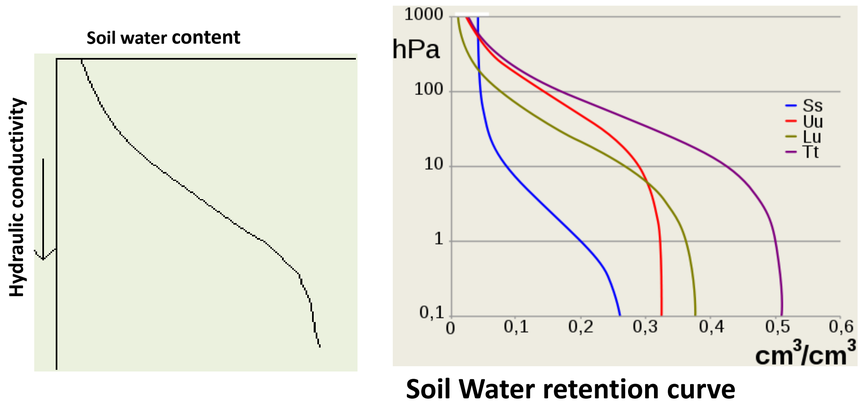
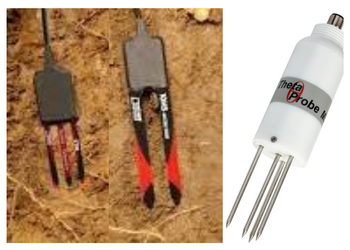


Figure.3. Porosity distribution of a soil samples by scanning with X-ray microtomography



Soil Water retention curve

Soil Moisture sensors: (Decagon 10HS, 5TM and ML3 Thetaprobe)



All the measurements will characterize the Macro and microscopic distribution of soil pores and hydrodynamic behavior of soil under different tillage and land management

Conclusion

All the experimental setup will help us to characterize the hydrodynamic properties patterns through the soil and to understand the effect of tillage, pedofauna, root development and crop residues on the distribution of soil structure and porosity. To capture the total soil moisture networks, the moisture sensors will be in the field during the crop seasons.

Since, tillage practices generally increase soil porosity, the correlation between soil hydraulics and porosity distribution would expect to be different for different tillage systems. In our study, **Winter ploughing retains more water due to the increase of macroporosity** than Strip tillage, No-till residues in and No-till residues out. As the changes in soil structure are usually noticed in the range of 9.8 to 98 hPa, so, we can conclude that **there is certainly structural change between ploughing and other conservation practices of reduced tillage and no tillage.**

For further details: : http://www.gembloux.ulg.ac.be/agricultureislife/