EGU2020-4624
https://doi.org/10.5194/egusphere-egu2020-4624
EGU General Assembly 2020
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Influence of cropping and fertilization on soil pore characteristics in a long-term field study

David Nimblad Svensson, Jumpei Fukumasu, Gunnar Börjesson, and **John Koestel**
Swedish University of Agricultural Sciences, Soil and Environment, Uppsala, Sweden (ddon0004@stud.slu.se)

Soil porosity, pore size distribution and pore characteristics such as connectivity are important for a range of soil processes including ease of root growth and air and water transport. The pore structure is therefore an important part of soil fertility. The pore space is sensitive to management practices such as tillage, fertilization and cropping. Understanding how these practices influence the pore space is important for maintaining a good soil structure that is well aerated and has sufficient drainage. X-ray computed tomography has become a widely used method for studying the pore space as it offers the advantage of enabling soil to be studied in its undisturbed form. In this study it was used to compare the effects of crop growth, tillage and N-fertilizing with $Ca(NO3)_2$ or farm yard manure (FYM). Soil samples were taken just below the surface from the long-term experiment in Ultuna, Sweden which was started in 1956. The bare fallow, FYM and $Ca(NO3)_2$-treatment were sampled with minimum disturbance in two column sizes with inner diameters of 22.2 and 65.5 mm. Differences in pore space morphology were quantified and compared through pore size distribution and a range of connectivity measures, including the Euler number, the critical pore diameter and Gamma connectivity. Biopores were separated from non-biopores and their volume was quantified. Soil organic carbon was determined by dry combustion. Visible porosity and pores in the 150-500 µm class were significantly larger in the FYM and $Ca(NO3)_2$-treatment compared to the bare fallow. The porosity occupied by biopores was not found to significantly differ between treatments but the biopores were found to have the largest diameters in the FYM-treatment. Despite that the organic carbon content was 1.7 times higher in the FYM compared to the $Ca(NO3)_2$-treatment the visible porosity was similar. This may be due to the positive effects calcium has on the soil structure. The connectivity measures indicated that the FYM-treatment had the best connected pore networks. This may be partly due to the larger biopores. $Ca(NO3)_2$ showed to be a promising alternative to increase porosity. However, as all the management practices in the long-term field study are done by hand, future studies will have to investigate if the effect is equally similar to FYM under field conditions which are subject to heavy machineries.