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Environmental analyse of soil organic carbon stock changes in Slovakia

Š. Koco, G. Barančíková, R. Skalský, Z. Tarasovičová, M. Gutteková, J. Halas, J. Makovníková, and M. Novákova

Soil Science and Conservation Research Institute, Gagarinova 10, 827 13 Bratislava, Slovakia (s.koco@vupop.sk)

The content and quality of soil organic matter is one of the basic soil parameters on which soil production functioning depends as well as it is active in non production soil functions like an ecological one especially. Morphologic segmentation of Slovakia has significant influence of structure in using agricultural soil in specific areas of our territory. Also social changes of early 90′s of 20′th century made their impact on change of using of agricultural soil (transformation from large farms to smaller ones, decreasing the number of livestock). This research is studying changes of development of soil organic carbon stock (SOC) in agricultural soil of Slovakia as results of climatic as well as social and political changes which influenced agricultury since last 40 years. The main goal of this research is an analysis of soil organic carbon stock since 1970 until now at specific agroclimatic regions of Slovakia and statistic analysis of relation between modelled data of SOC stock and soil quality index value. Changes of SOC stock were evaluated on the basis SOC content modeling using RothC-26.3 model.
From modeling of SOC stock results the outcome is that in that time the soil organic carbon stock was growing until middle 90′s years of 20′th century with the highest value in 1994. Since that year until new millennium SOC stock is slightly decreasing. After 2000 has slightly increased SOC stock so far. According to soil management SOC stock development on arable land is similar to overall evolution. In case of grasslands after slight growth of SOC stock since 1990 the stock is in decline. This development is result of transformational changes after 1989 which were specific at decreasing amount of organic carbon input from organic manure at grassland areas especially. At warmer agroclimatic regions where mollic fluvisols and chernozems are present and where are soils with good quality and steady soil organic matter (SOM) the amount of SOC in monitored time is still growing. At colder agroclimatic regions, at flysch region especially where cambisols are present with low of SOM stability since 1994 stability or decreasing of SOC stock is resulting. This is result of climatic impact (lower temperatures, higher humidity) as well as the way of soil management because at colder region the number of glasslands is increased in comparison to arable land.
Close relationship between SOC stock and soil production potential index representing the official basis for soil quality evaluation in Slovakia was also determined and a polynomial model was found which describes the relation at the 95% confidence level. From the obtained results it can be concluded, that the amount of crop residues and farmyard manure coming to the soil both in the first and second simulation period (1970 – 1995 and 1996 – 2007) was responsible for general trends in SOC stock dynamics. Achieved results also show different amount and changes of SOC stock in different agroclimatic regions. It was also found that that value of soil production potential index generally used for soil quality assessment in Slovakia corresponds well with simulated values of SOC stocks in top-soils of cropland soils.

Key words
Soil organic carbon stock, modelling, agricultural soils, agroclimatic regions, Slovakia

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