Geophysical Research Abstracts
Vol. 21, EGU2019-1453, 2019
EGU General Assembly 2019

SOC and Aggregate Stability Dynamics under Uneven-aged Oak Forestbelts

Dmitry Fomin (1,2)

(1) V.V. Dokuchaev Soil Science Institute, Moscow, Russia (fomin_ds@esoil.ru), (2) Lomonosov Moscow State University, Faculty of Soil Science, Moscow, Russia

One of the first investigations of the forestbelt impact on climate, yield and soil properties were implemented in the late 19th century (Tyulin, 1926; Tyulin, 1930). The biggest shelter forestbelt network was created as part of Great Plan for the Transformation of Nature during 1949-1963 years. Total surface area under forestbelts in USSR reached 1.3 million hectares (Pavlovskiy, 1986). Forestbelts were planted on arable Chernozems, which been continuously cultivated from the 17th century (Afanasieva, 1966). In this work, we collected and analyzed archive data and also measured current soil organic carbon (SOC) content, amount of air-dried and water-stable macroaggregates. The objects were located in middle part of Central Russian Upland (Kursk, Voronezh, Saratov regions of Russian Federation). The most common soil type of this regions is fine-silty Haplic Chernozem (Mollisol). In each region, we choose natural broadleaf forests above than 200 years old that have been accepted as the reference point. In addition, we described SOC and macroaggregate dynamics for 100-years cultivated Chernozems.
At the time of the forestbelt planting, Chernozem contained 5% of SOC. During the trees growing and forestbelt development, SOC content slowly has according to exponential growth model. In 80 years after forestbelt planting, SOC content has reached to the plateau and stabilized around 5.5% - carbon saturation level for fine-silty Chernozem under oaks. In contrast, SOC of arable soils quickly and linearly had decreased to 3.3% during the 100 years of cultivation. Similar trend we observed for amount of air-dried macroaggregates (0.25-10 mm after dry sieving by hands) and water-stable aggregates (>0.25 mm after fast wetting and wet sieving). Amount of air-dried macroaggregates has increased from 80 to 90% during the 60 years under forestbelts, and contrariwise, has decreased to 46% during the 100 years of cultivation. Amount of water-stable aggregates has increased from 60 to 84% during the 80 years under oaks and decreased to 20% during the 100 years of cultivation.
The quasi-stability of SOC content and soil macrostructure properties were observed in forestbelts from the age of 80 years and over. However, during the 100 of cultivation SOC continues to linear decline and macrostructure of arable soils degrades.