EVALUTION OF DEGRADATION OF SOME AGROPHYSICAL PROPERTIES OF THE GRAY FOREST SOILS

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Degradation manifests itself both in the decrease in soil productivity as a result of transformation of soil properties and in the total destruction of soil cover and development of rill and gully erosion. Soil degradation tends to increase and spreads over a large area within the agricultural zone. Therefore, investigations aimed at the prevention of physical degradation of soils are of great importance.

The investigations were carried out at the experimental field station of the Institute of Physicochemical and Biological Problems in Soil Science Russian Academy of Sciences in Pushchino. The following variants of soil management were chosen: permanent black fallow (5 years old), uncut grassland (7 years old), cut grassland (12 years old), winter wheat with grasses, and grasses sown for 2 years in the five-field rotation.

The type of soil management affects agrophysical properties of gray forest soil, i.e., bulk density, water retention capacity, and soil macrostructure. Numerous parameters characterize soil as a bio-abiotic body, but the aggregate composition may be among the most reliable parameters that distinguish soil from other natural formations. Changing environmental conditions primarily affect the formation and composition of soil aggregates. The aggregate composition of the soil studied is supporting evidence of this statement. We can arrange the types of soil management in order of their decreasing adverse effect on the water-stable properties of soil as follows: fallow, winter crops with grasses, grasses used during two years, cut grassland, and uncut grassland. Increasing soil degradation leads to an increase in bulk density and swelling capacity of macroaggregates, a decrease in porosity, and an increase in variability of the water stability of the macrostructure.

In recent years, bulk density has been considered as an integral indicator of physical properties of soil. It was found that field moisture capacity decreases from 0.42 to 0.24 g/g as the bulk density increases from 1.14 to 1.51 g/cm^3. Thus, soil compaction causes an abrupt decrease in the supply of available water.

The compaction of gray forest soil and the degradation of its macrostructure have caused a change in the water permeability. The minimum water conductivity measured in the field was in the soil under permanent fallow owing to the low water stability of macroaggregates, despite the fact that the upper layer of soil (0-20 cm) was sufficiently loose. An increase in the filtration coefficient of the soil under perennial grasses of the second year was recorded.

Soil degradation can occur on any of the levels of structural organization of the soil. For instance, processes of degradation in the gray forest soil under 5-year fallow are observed at the aggregate and horizon levels of structural organization.