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MONITORING OF DRAINED SOIL STRUCTURE IN HILLY AGRICULTURAL LANDSCAPE

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The aggregate composition of humus horizons (0–20 cm) of drained soils was studied in the agricultural landscape of the hilly-moraine Sambian plain (western part of the Kaliningrad region) on four relief elements: on the hill tops and slopes (Gleyic Cambisols (Aric, Loamic, Drainic)), in open and closed depressions (Gleysols (Aric, Siltic, Drainic)). Gleyic Cambisols with silt content of 6.6–7.3% and organic carbon content of 12.9 – 14.8 g C kg^{-1} soil had low values of the aggregation granulometric index
(20.4–21.1). The best aggregation potential was distinguished for Gleysols with high organic carbon content (on average 36.9 g C kg^{-1} soil) and the spring period of surface flooding until the beginning of April. As a result of monitoring in 2011 (arable land), 2013 (fallow), 2019 (arable land), multidirectional changes in the soil aggregation were observed. Already in the first year, an increase in total amount of water-stable aggregates in Gleyic Cambisols by 1.8–4.5% and in Gleysols by 11.7–13.9% was recorded under the grass vegetation on the fallow. The use of the intensive farming system based only on mineral fertilizers application led to the degradation of the water-stable aggregation in all the soil groups by 6.7–16.8%. At the same time, the amount of size fractions (10–0.25 mm in diameter) of air-dry aggregates and the soil structural coefficient increased in the Gleyic Cambisols, as a result of the soil tillage with multi-depth disking. Plowing of Gleysols in the waterlogged state was the reason for the lumpy soil structure formation. Similar distribution patterns of size fractions of air-dry aggregates were observed for the soil types under similar tillage treatments. The mean-weight diameter (0.4–0.6 mm) of water-stable aggregates in arable Gleyic Cambisols was insufficient to ensure the erosion resistance of the soils in the humid climate of the Sambian plain. To improve the aggregation of Gleysols in closed depressions, it is necessary to improve their reclamation condition.

Keywords. Aggregation ability, Gleyic Cambisols, Gleysols, land-use change, structural coefficient dynamics, water-stable aggregates.