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CLIMATE-OPTIMIZED ADAPTIVE-LANDSCAPE TECHNOLOGIES: CONCEPTUAL-THEORETICAL AND APPLICATIVE SUPPORT

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The current phase of evolution of arable chernozems in the Carpatho-Danubian Pontic space is characterized by the accelerated development of quantitative-functional changes manifested in interdependent and interdetermined degradation of the organic and structural-aggregate substances system.

Quantitative expression of the level of quantitative-functional degradation is the degree of physical degradation of arable chernozems, which is currently the main factor that determines the meaning of their anthropo-natural evolution.

Direct causes of quantitative-functional degradation are the profound transformations in the organization and functioning of the soil ecosystem accompanied by the reduction of the total amount of organic substances in the soil, the transformation of soil humic system composition and the amount of organic carbon sequestered and stabilized in structural aggregates. anthropo-natural chernozemic pedogenesis (metastructuring process).

According to our research, metastructuring is manifested in increasing the degree of clodding and hardsetting of the aggregate structure, compaction of aggregates <5 mm and reduction of their porosity below 40%, reduction of aggregate content 5-1 mm below 50% in the composition of agronomic-valuable structure (0, 25-10 mm), total loss of water stability for aggregates >3 mm.

In the composition of the humic system of the soils is reduced the content of calcium humate responsible for the formation of "chernozem" aggregates (5-1 mm), increases the content of water-soluble humates formed with monovalent cations (Na^+, K^+, NH_4^+). In the composition of fulvic acids, the content of the fractions of “aggressive fulvic substances” increases, leading to the intensification of the mineral transformation processes and the mobilization of the organo-mineral complexes with increased humus content. The changes in the specified humic system contribute to the "eluvial humus losses" of the active agrogenic layer during the wet period of the year. At the same time, the degradation of the aggregate structure leads to a reduction in the degree of physical protection of humus in structural aggregates, intensification of structure degradation due to water action and humus mineralization processes and, respectively, to increased greenhouse gas emissions from arable chernozems. This has led to the establishment of a one-way degrading trend in arable chernozems, accompanied by a significant reduction in the capacity to adapt to climate change and severe climate phenomena, in particular drought, and to an accelerated increase in soil vulnerability to them.

This implied the need to review the paradigm of management of arable chernozem resources by placing emphasis on technological elements capable of restoring the ability to adapt to climate change and reproduce basic agroecosystemic functions: reproductive living modeling, agro-productive.

Their key objectives are:

1. Restoration of the system of organic substances and the humic profile of the soils; Enlarged reproduction of the mass, composition and diversity of soil biota;
2. Restoring the priority role of the process of humus formation and accumulation in the anthropo-natural chernozem pedogenesis;
3. Optimizing the functionality of the pedofunctional system [system of organic substances ↔ structural-aggregate system] responsible for intensifying the processes of enlarged reproduction of chernozem pedogenesis.

More recent research has shown that to these imperatives corresponds the mulch tillage > the minimum tillage system with storage of more than 30% of organic residues at the soil surface (minimum tillage) > direct sowing (no-tillage) .

An important element of these technologies is the practice of bioorganomineral fertilization with products of humic origin.

Monitoring of the structural aggregate state of clayey loamy and clayey chernozems with moderate humus content showed that the administration of bioorganomineral fertilizers in the rhizosphere and in the philosphere by foliar treatment contributes, even in years with severe drought, to the establishment in the agrogenic layer of such a structural aggregation that contributes to increasing of the adaptability of arable chernozems to climate change and the severe climate phenomena induced by them.

During the vegetation period, the content of aggregates 5-1 mm is maintained in the range of satisfactory values, thus ensuring the conservation and rational use of evapo-perspiration of productive water reserves. In this context, the monitoring of the soil moisture regime showed even in conditions of severe drought at the end of the vegetation period of autumn crops (wheat, barley, rapeseed) the water content in the agrogenic layer is 0.45-0.52 FC *(Field Capacity).*

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