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PROBLEMS AND WAYS OF ENSURING THE SUSTAINABILITY OF POLISH AGRICULTURAL LANDSCAPES IN THE CONDITIONS OF CLIMATE CHANGE

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To ensure sustainable functioning of the agricultural sector of the state economy, balanced development of rural areas, increasing the ecological sustainability of agricultural landscapes is of key importance, especially in conditions of adverse climate changes [5, 7, 20, 32].

Climatic changes on a planetary scale can manifest differently at the level of individual regions, which is due to the indirect effect of climate on other interconnected factors of the ecosystem (in particular, soil-forming processes) [2, 15, 24].

Taking this into account, in the Polissia zone of Ukraine, under the conditions of a change in the hydrothermal regime, the spread of such negative processes as desertification, impoverishment of natural systems, degradation of wetlands, accelerated mineralization of peatlands, frequent fires in coniferous forests, etc. is predicted. In addition, climate change can lead to "an increase in the number, intensity, coverage and duration of extreme weather and climate events", the frequent change of which increases the danger of deflation during droughts and water erosion during torrential rainfall [4, 8, 10, 13, 17].

For the formation of the climate of Ukraine, which is generally considered favorable for agricultural production, the "microclimate manifested by the heterogeneity of horizontal and vertical gradients of climatological indicators" is important due to the complex interaction of the active surface in the systems of natural and anthropogenically modified landscapes, the functioning of which largely depends on level of economic development of the territory [5, 22, 24, 30].

A significant share of arable land in the structure of Polish agricultural landscapes increases their already significant ecological vulnerability to adverse external influences. Therefore, the solution to the problem of increasing the ecological sustainability of agrolandscapes in the conditions of Polissia should include, along with their anti-erosion management, optimization of the structure of land and cultivated areas (necessarily on the basis of relevant land management projects), and ensuring the ecological sustainability of the soil cover itself [1, 6, 11, 18].

The basis of anti-erosion management of agrolandscapes is permanent action measures, in which field protection forest strips play a special role [3, 4]. It is the latter, in addition to providing reliable protection of the soil cover from deflation processes,

that contribute to the improvement of the microclimate on the adjacent land plots and allow to bring this positive ecological impact to the "core" of arable lands [21, 28, 31].

Optimizing the structure of land should be carried out by removing unproductive and degraded soils from intensive cultivation and transforming them into hayfields and pastures, which, on the one hand, will ensure the formation of a reliable fodder base for animal husbandry, and on the other hand, reduce the level of anthropogenic load on soils and increase the ecological stability of agricultural landscapes [14, 16, 17, 19].

The structure of cultivated areas, which underwent significant changes during the reformation of land relations in the agrarian sector of the economy, also needs a return to the normative state. The increase in the share of highly profitable technical crops under the influence of the market situation is the reason for the violation of the scientifically based alternation of crops in crop rotations, the increase in the level of technological load on the soil, the decrease in the area under soil-protective crop rotations, the basis of which are perennial leguminous grasses [7, 9, 12, 25].

The latter not only protect the soil surface from the destructive effects of torrential rains and strong winds, but also have a positive effect on the main parameters of soil fertility. Despite the fact that with extreme manifestations of erosion processes, the main anti-erosion load is carried by permanent measures that form the framework of an ecologically sustainable agro-landscape, the intensity of these processes largely depends on the properties of the soil cover, since the soil itself is the main component of any agricultural landscape and, at the same time, the object of direct influence of water erosion or deflation [5, 7, 11, 23].

Dominant in the Polissya zone, the cohesive-sandy and sandy turf-podzolic soils are characterized by an unsatisfactory structural and aggregate composition, low humus content - 0.5-1%, increased density – 1.45-1.55 g/cm³, etc., and therefore – high susceptibility to storm and wind erosion. The anti-erosion resistance of the soil is largely related to the agrophysical parameters of the arable layer: aggregate composition, water permeability, compaction density, etc. [1, 4].

The key role in this aspect belongs to aggregates of the surface layer of the soil with a diameter of more than 1 mm, in particular water-resistant, the high content of which helps to slow down the flow of erosion processes. It was experimentally established that the combined use of limestone materials and fertilizers, depending on the norms of agrochemicals, contributed to an increase in the coefficient of structure by 8-17%, the content of agronomically valuable aggregates by 4-6%, the criterion of water resistance of the structure by 17-28%, and the content of water-resistant aggregates larger than 1 mm – by 29-62%.

The improvement of the structural and aggregate composition of the soil during the application of fertilizers on limed areas is due to positive changes in the structure of the absorption complex of the soil under the influence of calcium and lime and an increase in the content of humus and an improvement in its qualitative composition due to the accumulation of calcium humates, without the participation of which cementation of soil aggregates is impossible.

The combination of fertilizer with liming makes it possible to reduce the volume mass of the root layer of the soil by 0.08-0.13 g/cm³ on average per crop rotation. At the same time, the water permeability of the soil, the value of which is an indirect indicator of its anti-erosion resistance, increases under grain and row crops by 24-118 and 11-63%, respectively, which is explained by the increase in soil porosity and water-resistant macro- and microstructure.

In market conditions, an objective assessment of measures to increase the ecological sustainability of the soil cover is impossible without taking into account their economic efficiency, since they require additional capital costs for their implementation [23, 26, 27, 29].

According to the research results, the economic efficiency of the proposed agromelioration measures (application of fertilizers and lime) is due to the annual production of additional crop production at the level of 22-25 t·ha⁻¹ of grain units. At the same time, the highest conditionally net income (0.47 hryvnias per 1 hryvnia of expenses) was obtained with the complex application of single norms of mineral, organic fertilizers and limestone flour.

Therefore, increasing the ecological sustainability of the agrolandscapes of Polissia in the face of adverse climate changes is based on a comprehensive approach that involves a combination of organizational and economic measures aimed at anti-erosion management of the territory and agromelioration measures designed to increase the soil cover's resistance to the possible negative impact of external factors.

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