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# SOME FEATURES OF THE AGROCHEMICAL COMPOSITION OF THE SOILS OF THE WESTERN POLISSYA OF UKRAINE

# ДЕЯКІ ОСОБЛИВОСТІ АГРОХІМІЧНОГО СКЛАДУ ҐРУНТІВ ЗАХІДНОГО ПОЛІССЯ УКРАЇНИ

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***Abstract.*** *The results of the study and analysis of the chemical composition of the soils of the Western Polissya of Ukraine are presented in this work. This region includes the northern regions of Rivne and Volyn' regions. We characterized the geographical and ecological features of Western Polissya. Changes in the chemical composition of the soil were analyzed under the influence of climatic changes and changes in the structure of crops. The analysis was made over the last three decades. Changes in humus content in soils were also analyzed. The dynamics of the content of the main chemical elements in the soil is determined. These are nitrogen, phosphorus, potassium, zinc, manganese, copper, cobalt, boron. Prospects are defined for the further development of the field of crop production.*

***Keywords****: Western Polissya, soil, humus, chemical elements, dynamics of changes, agricultural production.*

## Introduction.

Western Polissya of Ukraine is a complex of biocenoses, unique both for Europe and for the whole world. We include the northern districts of Rivne and Volhynia regions in Western Polissya, or another name is Volyn' Polissya. A noticeable expansion over the past 50 years of the scale of agricultural production on the territory of Volyn' Polissya has largely influenced its natural complexes and flora, as their integral component. Growing of cultivated plants on large areas that were previously occupied by natural phytocenoses, and the use of grasslands for grazing animals or haymaking cause significant negative changes in the species composition of the spontaneous flora of the region [1].

The purpose of our research is to analyze the impact of agricultural production and climatic changes on the agrochemical properties of the soils of the region and to determine the prospects for the further development of the field of crop production.

## Main text.

The region is characterized by a flat relief, a temperate climate, a zone of mixed forests, and a large number of wetlands. The tectonic and geo-logical structure determines a significant variety of agrosoil conditions. On the territory of Polissya, acidic soils with low humus content prevail: turf-gleyed, turf-hidden-podzolized sandy (brown sands), low-lying and peat-boggy peatlands, in the lowlands of rivers there are meadow and meadow-chernozem soils [2, 3]. Over the past 30 years, the average

annual air temperature has increased by 1.0–1.5 °C. The sums of active temperatures increase, the amount of precipitation decreases, and the conditions for atmospheric humidification deteriorate. At the same time, there is an increase in conditions and phenomena dangerous for agriculture: the frequency of occurrence of atmospheric drought, the number of days with dry wind, the number of days with frost, the duration of the frost-free period and the frequency of years with freezing of winter crops. Proceeding from eco-nomic feasibility and climatic possibilities for the period after 1991 there have been changes in the structure of cultivated areas. The range of cultivated crops has expanded, namely, significant areas of industrial crops – corn, rapeseed, sunflower and soybeans have appeared. The production of grain and leguminous crops has decreased by 2 times; sugar beet by 140 times, the cultivation of flax has completely stopped. Potato production has increased by 80% and vegetable production by 130%. The main trends of the last three decades: an increase in the sown area of industrial crops, which, in turn, displace traditional crops, attempts to intensify farming, a decrease in the number of mineral fertilizers applied by 2.0 times, organic fertilizers by 15.0 times, a decrease in the number of cattle by 6.0 times, pigs by 2.2 times, sheep and goats by 9.3 times. All this increases the imbalance of the agroecosystems of the region, as a result of which their self-reproduction and self-regulation is disrupted [4].

Sufficient humidification and the increase in the supply of heat contributed to the production of technical crops in the territory of the Rivne region commensurate with the indicators of the southern regions of Ukraine (Odesa, Mykolaiv, Kherson and Zaporizhzhya). These cultures are typical for these regions. The yield of rapeseed in the Rivne region is on average 28% higher than in the south of Ukraine. Sunflower yield is 50% higher. The yield of soybeans is similar to the indicators of the south of Ukraine [4].

In recent years, with scientific and technical development, significant transformations have been observed in the structure and technological processes of various branches of production, including agriculture. Of course, such changes affect the natural properties of soils, changing their condition and functions.

A significant part of the soil cover of the Western Polissya consists of sod-podzolic soils of various granulometric composition, degrees of gley and podzolicity, which were formed mainly on non-carbonate sandy and sandy loam deposits of light granulometric composition, in conditions of increased moisture, under mixed forests with a dense grassy cover.

Turf-podzolic gley soils have a sandy and light loam granulometric composition. They are characterized by low moisture content and water permeability, very low hygroscopicity, they have low indicators of the number of absorbed bases and buffering, low supply of humus and nutrients. Therefore, these soils require anthropogenic regulation in the process of agricultural use. In the Polissya zone, annual losses of humus amount to 0.7–0.8 tons/ha. The reason for this is also the insufficient compensation of humus losses with organic fertilizers and plant residues of sideral crops. Therefore, agrotechnical measures for the cultivation of sod-podzolic soils should be aimed at maintaining the optimal level of the quantitative and qualitative composition of humus [5].

The output of humus from one ton of organic fertilizers is 42 kg in the Polissya zone.

The study area is located in the North Atlantic-Continental climatic region. The climate is moderately continental: mild winters with frequent thaws, warm summers, average annual precipitation is 650-700 mm.

The soil cover of the Western Polissya is heterogeneous, it is characterized by a large variety of soil-forming rocks. They contributed to the formation of a significant number of agricultural soil groups. A significant part of the soil cover of the Western Polissya consists of sod-podzolic soils of different granulometric composition, degree of gley and podzolicity.

Samples of various agricultural production groups were selected to determine the physical, physicochemical, agrochemical and ecological condition of sod-podzolic soils of the Western Polissya zone [6]. These are samples: 5b of sod-podzolic and sod unglazed and silty clay-sandy soils on sandy deposits, used under hayfields and pastures in the Berezniv district (Yarynivka village) and Goshchan district (Zhalyanka village) districts; 27b of sod-podzolic gley drained clay-sand - under arable land in Dubrovytskyi district (Lyudin village); 14b of sod-podzolic and podzolic-sod clay loamy-sandy - under hayfields in the Rokytnivskyi (Rokytne village) district. The main criteria for soil sampling locations were the differences in agricultural production groups based on different methods of use.

The greatest thickness of the humus layer is observed on the sod-podzolic soil of agro-production group 14b under the hayloft and is 30 cm. The thickness of the humus layer is slightly lower for 5b under the pasture and hayloft - 22 cm; the lowest thickness is for agricultural production group 27b under arable land - 15 cm [6, 7].

Therefore, for the creation of special raw material territories, according to the capacity of the humus layer, the sod-podzolic soil 14b under hayfield is suitable, limitedly suitable (22-15 cm) - 27b under arable land, 5b under pasture and hayfield.

Turf-podzolic soils in the studied areas are characterized by a low and medium degree of calcium supply: 27b low degree of supply (3.3 mg-eq per 100 g), 14b (5.3 mg-eq per 100 g) and 5b (8.0– 10.5 mg-eq per 100 g) – average; a very low level of magnesium supply (<0.6 mg-eq/100g); low content of mobile sulfur (3.1–6.0 mg/kg), with the exception of the arable layer (0–30 cm) of arable land, where it is 7.8 mg/kg, this indicates an average degree of security (6.1–12 .0 mg/kg). The indicated indicators decrease with depth.

Sod-podzolic soils of various agricultural production groups in the studied areas are characterized by an average (14b – 2.3%) and low (27b, 5b – 1.7–1.9%) degree of humus provision, which decreases with depth. According to this indicator, 14b is suitable for creating special raw material zones, all others are limited.

Agricultural production groups have a very low content of nitrogen, which is easily hydrolyzed (<101 mg/kg). With the depth of the soil profile, similarly to the previously considered indicators, a decrease in its content is observed.

According to the indicator of the content of mobile phosphorus compounds, 14b are characterized by a very high degree of supply (311 mg/kg), 5b under pasture is high (101–150 mg/kg), and the others are average (51–100 mg/kg of soil). 14b and 5b under pasture are suitable for creating special raw material zones, the others are of limited

use.

Plots 14b and 5b under haymaking are characterized by a very low degree of availability of mobile potassium compounds (<41 mg/kg of soil). Areas under pasture have a low potassium content of 27b (48 mg/kg) and 5b (60 mg/kg). According to this indicator, the land is not suitable for the creation of special raw material zones.

Plots 14b and 5b have a very low degree of security in terms of the content of mobile zinc compounds (<1.1 mg/kg), 27b – low (1.3 mg/kg). According to the zinc content, the land is not suitable for the creation of special raw material zones.

Plot 5b under the pasture is characterized by the content of mobile manganese compounds with a high degree of supply (group V, 15.98 mg/kg), other sites have a higher degree (group IV, 10.1–15.0 mg/kg). According to this indicator, the lands are limitedly suitable for the creation of special raw material zones (20–10 mg/kg).

All agro-production groups of sod-podzolic soils are included in the II group with a low degree of security in terms of the content of mobile copper compounds (0.11–0.15 mg/kg). According to this indicator, the lands are not suitable for the creation of special raw material zones.

According to the indicator of the content of mobile cobalt compounds, agricultural production groups 14b and 5b are included in the VI group, which is characterized by a very high degree of availability (0.30–0.49 mg/kg), 27b – in the V group with a high degree of availability (0.21–0 .30 mg/kg). According to this indicator, arable land is limitedly suitable (0.30–0.15 mg/kg) for creating special raw material zones, other types of land are suitable (>0.30 mg/kg).

Agricultural production groups 27b and 14b belong to the V group with a high degree of security in terms of the content of mobile boron compounds (0.51–0.70 mg/kg), 5b belongs to the IV group with an increased boron content. According to this indicator, the studied lands are suitable for the creation of special raw material zones (0.70–0.33 mg/kg), with the exception of 5b under the pasture, this area is limitedly suitable [6, 7].

The dynamics of the humus balance in different regions indicates the strengthening of the dehumification processes. The negative balance of humus in the agriculture of the Polissya zone is observed during all periods of research. Starting from 1981–1985, the negative balance of humus continued to grow. Its deficit increases by 2.5 times and amounts to -0.73 tons/ha (2006–2010). At the same time, it should be noted that the most significant difference in the negative balance of humus is observed in the Rokytniv and Volodymyretsky districts of the Rivne region. According to the data of 2006–2010, it decreased in Rokytniv district by 0.40 tons/ha, and decreased in Volodymyretsk district by 1.05 tons/ha. In the period 2011–2015, the humus balance deficit decreased in the Polissya zone to -0.29 tons/ha [3].

**Conclusions.**

Calculations of average losses and inputs of organic and nutrient substances during the cultivation of agricultural crops in the territory of the Rivne region for the period 2000-2020 prove that agroecosystems are losing their dynamic balance.

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