AGRICULTURAL SCIENCES

UDC 631.445.2:631.459

Kucher Larisa,
Musiienko Vadym,
National university of life and environmental sciences of Ukraine, Kiev,
Poltoretskyi Sergyi,
Uman national university of horticulture, Ukraine
Lapchynskyi Vitalii,
Higher Educational Institution "Podillia State University", Kamianets-Podilskyi,
Shuvar Antin,
West Ukrainian National University, Ternopil, Ukraine,
Balitska Liudmila,
Kostenko Natalya,
Ukrainian institute for plant varieties examination, Kiev, Ukraine,
Yarosh Yurii
SSS «Oleksandra Maynova Bobrovytsya professional college of NULES of Ukraine»

EVALUATION OF THE LEVEL OF DEGRADATION OF GRAY PODZOLIZED LIGHT LOAM SOIL IN LOESS

Abstract.
The study of indicators of high-quality gray podzolized light loam on the forest soil of Polissia and Forest Steppe of Ukraine is shown in the article. Information on the content of nutrients, humus, soil solution acidity is summarized in these soils to determine the ecological and agrochemical state of the soil cover of arable lands. The degree of degradation of these soils was determined. Gray podzolized soil is characterized by humus content as moderately degraded with a decrease in humus content by 10.8% relative to the standard, by soil solution acidity and potassium content as slightly degraded

Keywords: *soil monitoring, degradation, assessment criteria, gray podsolized soil.*

Introduction.

Gray podzolized soils within the forest-steppe of Ukraine make up a significant share of land resources. Possessing a number of favorable properties, these soils are extremely vulnerable and quickly transform when used irrationally. Evidence of this is the intensification of degradation processes within the Polissia and Forest Steppe. The most common and most dangerous degradation process of this area is water erosion. Erosive processes cause significant damage to agricultural production, as a result of which the cultivation of agricultural crops on sloping lands is unprofitable or unprofitable [13].

In connection with recent events in Ukraine, control and monitoring of soils is almost not carried out, and landowners and users are only interested in obtaining a harvest, which has led to irrational and illiterate use of soils [2].

Ukraine has 80% of agricultural land that is subject to cultivation. Without proper and competent use of these lands, the problem of physical and chemical degradation of these lands becomes acute [7]. The territory of Chernihiv Oblast is also characterized by a high degree of land development. The total land fund is 5.2% of the land area of Ukraine, and agricultural land in the structure is 66% [10].

Chernihiv region is located in two physical and geographical zones: Polissia and Forest Steppe, which caused a complex structure of the soil cover. The explication of the soils of the agricultural lands of the region contains 253 soil withdrawals [12]. Since the soil cover of the Chernihiv region is characterized mainly by low-humus soils of a light granulometric composition, which causes their low absorption capacity, low buffering capacity, low saturation with soil colloids, the significant condition for the formation of the crop yield is the intensity of the use of fertilizers as the main factor of sustainable agriculture [9].

It is important to observe individual, most informative, from the point of view of diagnosing the degree of anthropogenic pressure on agrolandscapes, indicators of fertility, in particular, observation of the content of one of the main components of the soil, humus [3]. Research results make it possible to control the content of humus in the soil, as well as to solve the issue of preserving and increasing its content.

Every year, 11 million tons of humus, 0.5 million tons of nitrogen, 0.4 million tons of phosphorus, and 0.7 million tons of potassium are removed from the soil. Ecological and economic losses from soil erosion exceed 9 billion. UAH [7, 8].

According to the agrochemical survey of the State Fertility Service of Chernihiv Region, more than 533,000 hectares of land are subject to land reclamation. This measure contributes to the improvement of physico-chemical and physical properties of soils, activates microbiological processes, provides crops with magnesium and calcium [1].

Given the significant natural resource potential, Ukraine faces many different risks when using it, which makes it uncompetitive on the world market. Taking into account how the sectors of the economy of other

countries of the world, including agriculture, are actively developing, Ukraine loses significantly both in competition and in the costs of production and resources, as well as in trade operations, trading raw materials and not creating added value in the country [4]. However, it is necessary to take into account not only quantitative indicators of the natural resource (soil), but also qualitative ones, covering soil fertility, availability of water resources, climatic conditions that directly affect agricultural production and, as a final result, the cost of the obtained products.

Today, Ukraine is characterized by simple, sometimes primitive forms of environmental management, inefficient or costly production methods, a low level of social organization, and the loss of political control over the territory [11].

About 24 million tons of humus, 0.68 tons of phosphorus, 9.4 tons of potassium, and 0.96 tons of nitrogen are removed as erosion products. These numbers are much more significant than the doses of application of these elements with fertilizers. According to the research of V.V. Dokuchaev, the content of humus in the arable layer of soils in most regions of Ukraine was equal to 5.3–6.1%, and 20 years ago its content in the arable layer on average in the country was from 3.3 to 3.8 %. Modern examinations by specialists of the State University "Institute of Soil Protection of Ukraine" fix the humus content at the level of 3.0%. The loss of 1 cm of arable soil layer in the fields leads to a decrease in the yield of grain crops by an average of 0.5 t/ha [6].

Research materials and methods.

The climate of the Chernihiv region is temperate Atlantic-continental with short, moderately mild winters and warm, long summers. The relief of the Chernihiv region is mainly a lowland plain, in some places shallowly incised, undulating. The article uses statistical data on the structure of the land fund of Chernihiv region, provided by the Main Department of State Land Management Committee in Chernihiv region as of January 1, 2022, explanatory text to the soil cover map of Chernihiv region. Scientific data on the structure of the soil cover of the regions and diagnostic criteria for the degree of soil degradation were used. Degradation processes were analyzed in gray podzolized light loamy soil in the loess [5].

Results and discussion.

The analysis of the state of the soils of the region shows an increase in the areas of eroded, degraded and unproductive lands that are subject to conservation on the total area of almost 78-87%.

Gray podzolized soils - low-humus with an indicator of the humus content of the upper genetic horizon - 1.9%, have a slightly acidic reaction of the soil solution (pHкcl 5.2), insignificant hydrolytic acidity, low saturation with bases, an average content of mobile phosphorus, exchangeable potassium and nitrogen, which is easily is hydrolyzed, in the upper horizon There is an accumulation of mobile phosphates in the illuvial horizon, where they are retained during washing. The content of mobile sulfur according to the turbodimetric method is low. The content of manganese and boron is very high.

Gray podizolized soil is rated as moderately degraded by the content of humus with a decrease of 10.8% relative to the standard, and by the acidity of the soil solution and the content of potassium as slightly degraded (Table 1).

Table 1

Assessment of soil degradation levels

Index	Degree of soil degradation			
	weak	medium	strong	full
Reduction of humus content in % from the initial value	-*	10,8 (5-20)	-*	-*
pH_{kcl}	5,2 (5,5-5,0)	-*	-*	-*
K_2O	67 (80-40)	-*	-*	-*
Reduction of humus content in % from the initial value	-*	10,8 (5-20)	-*	-*
pH_{kcl}	5,2 (5,5-5,0)	-*	-*	-*

Note: "-*" - indicator is within the normal range

Conclusions and suggestions.

Gray podsolized light loamy soil in the loess is characterized by humus content as moderately degraded with a decrease in humus content by 10.8% relative to the standard, and by the acidity of the soil solution and potassium content as slightly degraded. The obtained data should be taken into account when planning measures to preserve the soil structure and increase its fertility.

List of references:

1. Baybyekov R., Gulyuk G., Akanova N. Prospects for chemical reclamation of acidic soils. *Melioration and Water Management.* 2021 1(6): 19-24. doi.org/10.32962/0235-2524-2020-6-19-24.

2. Beregniak E., Beregniak M., Myronycheva O. et. al. Ecological Analysis of the Current State of Forest Resources in Forest Steppe of Ukraine. *J. of Ecological Engineering*. 2023. 24(1): 87-96. doi.org/10.12911/22998993/155951.

3. Chorna T.M., Makarova H.A., Kravchenko K.M., Hantsevska N.A. Basic indicators of soil fertility of the Mykolayiv region according to the results of the

IX round of agrochemical survey. *Scientific works. Ecology*, 2011. 150 (138): 64–68.

4. Economics of Adaptation to Climate Change. 2011. URL: http://www.worldbank.org/en/news/feature /2011/06/06/economics-adaptation-climatechange.

5. France J., Thornley J.H.M. Mathematical Models in Agriculture: Quantitative Methods for the Plant, Animal and Ecological Sciences. CABI, 2007. 906.

6. Holoborodko S.P., Granovska L.N. The natural environment of the Southern Steppe: efficiency of use. Kyiv. Agricultural perspective. 2013. 8: 76–81.

7. Kucher L., Kyfak V., Verbivska L. et. al. The Influence of the Social and Economic Situation on Agribusiness WSEAS Transactions on Environment and Development. 2022. 18. doi.org/10.37394/232015.2022.18.98.

8. Kuharuk E.S. The state of eroded soils in Moldova and economic damage from erosion. Soil Erosion. 2019. 1. doi.org/10.18411/978-9975-139-95-3-2019-5-13

9. Melnyk A.I., Katsenko S.M., Shabanova I.I. Ecology: problems of adaptive-landscape agriculture: a collection of articles of a scientific conference with international participation. Zhytomyr: «DAEU». 2005: 47-55

10. Petryshyna O.V. Structure land tenure in Chernihiv region. Odesa National University Herald. Geography and Geology, 2015. 19(4(23)): 159-166. doi.org/10.18524/2303-9914.2014.4(23).39358.

11. Ryabtsev M.P. Flooding and flooding of the territories of populated areas - problems that require a comprehensive solution. Reclamation and water management. Kyiv: Agrarian Science, 2005. 92: 173-182.

12. Shpylky Yu.M., Mukosii M.P. 50 years on the guard of soil fertility of Chernihiv region (scientific and information publication). 2014.

13. The concept of combating land degradation and desertification: Order of the Cabinet of Ministers of Ukraine dated October 22, 2014. 1024. Database "Legislation of Ukraine" / Verkhovna Rada of Ukraine. https://zakon.rada.gov.ua/laws/show/1024- 2014-%D1%80#Text.