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AGRICULTURAL ASSESSMENT OF SOIL CONDITION IN DEPENDENCE ON THE INTENSITY OF AGRICULTURAL CHEMISTRY

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Abstract

The article presents studies on agroecological assessment of the state of the forest-steppe soil, depending on the intensity of agriculture chemistry. The purpose of the research was to identify changes in the agro-ecological state of the soil, depending on the intensity of agriculture, as a factor of the transition of pollutants accumulated in the soil into grain and seeds of the main field crops. The researches were carried out in the farms of Vinnytsia region, using resource-saving and intensive technologies of growing crops. The studies were aimed at identifying the tendency of change of agrocological indicators of dark gray podzolized soil depending on the intensity of the use of means of chemisation. Laboratory analyzes of the investigated soils were carried out in a certified laboratory of the testing center of the Vinnytsia Branch of the State Institution «Institute for Soil Conservation of Ukraine».

It was established that the content of mobile metals of heavy metals in the forest-steppe agro-ecosystems of the right bank at different levels of agriculture chemistry, the residues of organochlorine pesticides differed within the error and did not exceed their maximum permissible concentrations.

Keywords: mineral fertilizers, pesticides, soil, intensity, pollution, agriculture, heavy metals.

The current crisis state of the land resources of Ukraine, the deterioration of the ecological state of the lands of intensive agricultural use, the decline in soil fertility and the large-scale spread of soil degradation processes necessitate significant changes in human economic activity and environmental management. In this regard, it is extremely important and relevant to use an integrated approach to assessing the current agroecological state of agricultural land [1]. Agroecological land assessment is carried out in order to determine the level of soil fertility for growing certain groups of crops, comparing the requirements of agricultural crops to growing conditions with the agroecological conditions of a particular territory [2]. An important indicator that is taken into account in the agroecological assessment of a site is its geomorphology. An agroecological assessment of geomorphology is needed for crop selection and main processing strategies. Agroecological assessment of land in a certain way correlates with economic assessment, socio-ecological and environmental-economic [2].

Environmentally unjustified agricultural production led to significant losses of the humus layer of the soil, the development of erosion processes, an increase in areas of acidic and saline soils, a decrease in the content of nutrients and beneficial microflora, pollution with pesticide residues, heavy metals, radionuclides [4, 5, 6].

Therefore, in order to solve the problems that have arisen in the field of land use, as well as for the development and implementation of scientifically based measures for the ecologically balanced use of agricultural land, it is necessary to have information on the agro-ecological state of soils.

Soil is a thin upper layer of the earth's crust, which arose as a result of its transformation under the influence of water, air, organisms and has natural fertility. Soils consist of solid, liquid and gaseous parts, plants, animals, microorganisms and is one of the components of the biosphere, the basic component of any landscape [7].

Soil is a unique, irreplaceable natural resource, solar energy storage, the basis of plant, animal and human life, as well as a natural indicator of environmental pollution [8].

Soils function as a habitat, accumulator and sources of matter and energy for organisms, an intermediate chain between biological and geological circulation, a protective barrier and conditions for the normal functioning of the biosphere as a whole, and the like. The named functions of soils form their ecological potential [9].

Agroecological potential, that is, the ability of soils to perform the function of agricultural land, create optimal conditions for the growth and development of agricultural plants, as well as maintain ecological balance in agricultural landscapes and the natural environment, was determined by indicators characterizing: the thickness of the humus layer of the soil; nutrient content; groundwater level and salinity; biotic potential or bioproductivity of land (average annual productive moisture, growing season, average annual radiation balance) resistance of soils to pollution (sums of active temperatures, steepness of slopes, rockiness, structure, resistivity, mechanical composition, humus content, type of water regime, pH reaction, ion capacity, silting, plowing, economic development) contamination with radionuclides (cesium, strontium, plutonium, americium), heavy metals (total content of boron, molybdenum, manganese, zinc, cobalt, nickel, copper, chromium, lead and others), pesticides and mineral fertilizers, taking into account the natural characteristics of soils; unfavorable natural and anthropogenic processes [9].

Technogenic pollution causes significant environmental damage to soils. It depends on the type of soil, the amount of industrial waste, heavy metals, radionuclides, pesticides and mineral fertilizers.

Soil pollution by industrial emissions and chemicalization of agriculture is one of the potential contaminants of land resources. In cities, the common source of soil pollution with heavy metals are enterprises of ferrous and non-ferrous metallurgy, light industry. The danger of soil pollution is determined not only by the content of heavy metals, but also by the hazard class of certain toxicants. The first hazard class includes arsenic, cadmium, mercury, selenium, lead, zinc, fluorine, benz (a) pyrene; to the second - boron, cobalt, nickel, copper, molybdenum, antimony, chromium; to the third - barium, vanadium, tungsten, manganese, strontium. Their content in soils can be estimated both by gross and mobile forms of elements. Many of them can lead to morbidity in humans [7].

Soil pollution with chemical plant protection products is complex. A several-fold decrease in the use of pesticides in recent years, although it contributed to a decrease in soil and agricultural products pollution with pesticides, has not significantly changed the situation. This is due to the fact that the residual amount of pesticides is in the soil for a long time [7].

During the period of the most intensive use of chemicals, when 5.5 kg of pesticides were used per hectare of arable land, their residues ended up in 50-60% of soil samples and in 30-35% of plant samples, incl. 2.5% with an excess of MPC in soil and 3.5% with an excess of maximum permissible levels in food products and 2.5% in feed. For some preparations from the group of persistent organochlorine compounds (polychloropinene, polychlorinated fel, celtan), the frequency of detection of residues in the treated fields reached 90-98%, incl. up to 10% with an excess of MPC.

An even more unfavorable situation was observed with respect to contamination with symmetriazine herbicides, the remains of which appeared in the soils 3-4 years after treatment in 56% of the samples. Their high persistence and phytotoxicity led to the death of sensitive crops in large areas. The greater the pesticide load on soils, the higher their harmfulness to the population [5].

About 50% of the total yield increase is provided by mineral fertilizers, 25% - by cultivation technologies. However, do not forget that the improper use of mineral fertilizers - nitrogen, phosphorus, potassium, complex and others - is accompanied by undesirable side effects: pollution of the natural environment and is explained by the unbalanced use of fertilizers, deviation from the norms of their application. Some types of mineral fertilizers can increase the acidity of soils, the accumulation of hazardous residues in them. It is known that plants absorb only 50% of nitrogen and 10-20% of phosphorus fertilizers, the rest is washed out by atmospheric precipitation. If mineral fertilizers are used improperly in the natural environment, nitrogen, phosphorus, potassium can accumulate in increased amounts. This leads to acidification of the soil solution, pollution of groundwater as a result of filtration of fertilizers (especially nitrogen), an increase in the content of nitrates, sulfates, chlorides in well water, the accumulation of residual reserves of nitrate nitrogen in crop production, pollution of reservoirs, rivers with fertilizer residues due to erosion processes, etc.d., causing harm to the health of people, animals, fisheries [9].

In recent years, the agricultural landscapes of Ukraine have been constantly exposed to various types of radiation pollution - atmospheric emissions of radionuclides as a result of nuclear weapons testing, waste from processing raw materials at nuclear fuel cycle enterprises, and the like.

Collection, analysis and generalization of radiological survey data of arable land in Ukraine showed that the contamination of cesium-137 above 37 kBq / m2 on agricultural land in Ukraine is spread over 461.7 thousand hectares, of which arable land is 345.9 thousand hectares. The contaminated areas are stored on the territory of 12 regions, where 8.8 mln. ga [10].

Strontium contamination of soil on agricultural land in Ukraine is observed on a much larger scale than cesium. Within 0.74-5.55 kBq / m^2, strontium-90 contaminated 4.6 million hectares, which is 52% of the surveyed area. Such an intensive spread of this radionuclide on the territory of Ukraine is due, first of all, to the global emissions of strontium-90 during tests of nuclear weapons in the atmosphere [9].

The research was carried out in the farms of the Right-Bank Forest-Steppe, using resource-saving and intensive technologies for growing grain crops. The research was aimed at identifying the tendency of changes in agreological indicators of dark gray podzolized soils, depending on the intensity of the use of chemicals.

The studies were supposed to study the influence of the intensification of agriculture on the change in the content of salts of heavy metals and pesticides in grain and seeds of the main field crops: winter wheat, spring barley, winter rape, corn, sunflower, soybeans, peas and buckwheat.

The effect of the intensity of the chemicalization of farming systems in the cultivation of basic agricultural crops on the agroecological state of the soil was aimed at revealing the change in the agroecological state of the soil, depending on the intensity of agriculture, as a factor in the transfer of pollutants accumulated in the soil into grain and seeds of the main field crops.

Soil samples were taken from the 0-20 cm layer in accordance with DSTU ISO 10381-1: 2004 [11]; determination of the content of humus in the soil - using the Tyurin method in accordance with DSTU 4289: 2004 [12]; determination of the content of mobile forms of heavy metals (Pb, Cd, Zn, Cu) - after removal with an acetate-ammonium buffer solution pH 4.8 by atomic absorption spectrophotometry in accordance with DSTU 4770 [13]; determination of the reaction of soil pH salt - ionometric in accordance with DSTU ISO 10390-2001 [14, 15]; determination of hydrolytic acidity - by the Kappen method in accordance with DSTU 7537: 2014 [14, 15]; determination of the content of hydrolyzed nitrogen in the soil - by the Cornfield method according to GOST 7863: 2015 [16, 18, 20,]; determination of the content of mobile forms of phosphorus and potassium in the soil - by Chirikov's methods according to DSTU 4115-2002 [14, 16, 19].

The dark gray podzolized soils were formed mainly in liquefied lighted forests with a well-developed herbaceous cover. Signs of podzolization in comparison with gray soils are weakly expressed, and the processes of humus accumulation are intensified.

The dark gray podzolized soil is characterized by the following properties: the humus-eluvial horizon is dense, and all the horizons below are very compacted. According to their granulometric composition, they are light and medium loamy [21].

Soil porosity is closely related to density. In dark gray podzolized soil, it is satisfactory for the arable layer (51%) and then drops to 44-50% [21].

Agrophysical properties of dark gray podzolized soils are satisfactory and good, characterized by a fairly stable water regime. In them, the number of waterproof aggregates noticeably increases, soils float less, and a crust forms less often. The moisture content increases significantly, but at the same time the amount of inaccessible moisture also increases. They have high natural fertility [21].

The potential fertility of dark gray podzolized soils is quite high. Their bonitet ranges from 37 in sandy loam to 55 points in heavy loamy varieties [21].

Our research has established that in the conditions of the Right-Bank Forest-Steppe within the Vinnytsia region on dark gray podzolized soils, where intensive chemicalization technologies are used, a high humus content was in the field where winter rape was grown – 4.4%. On the plot where sunflower was grown, the humus content was 0.2% less, where corn was grown - 0.7% less, spring barley – 0.9% less and where winter wheat was grown – 2.1% less and amounted to 2.3%.

The high content of hydrolyzed nitrogen was in the soil where sunflower was grown - 98.0 mg/kg. In the area where barley and corn were grown, the content of hydrolyzed nitrogen was 2.1% less, where winter wheat was grown – 2.8% less and where winter rape was grown – 3.5% less and amounted to 70.0 mg/kg.

A high content of mobile phosphorus was in the soil where corn was grown – 319.0 mg/kg. In the area where winter wheat was grown, the content of mobile phosphorus was 1.2% less, where barley was grown – 3.8% less, where sunflower was grown - 3.9% less and where winter rape was grown – by 16.0% less and amounted to 159.0 mg/kg.

The high content of mobile potassium was in the soil where winter wheat was grown – 239.0 mg/kg. On the plot where barley was grown, the content of mobile potassium was 4.2% less, where sunflower was grown – 6.9% less, where maize was grown – 12.7% less and where winter rape was grown – 13.9% less and amounted to 100.0 mg/kg.

A high content of calcium was in the soil where winter rape was grown – 164.0 mg.eq/kg. On the plot where sunflower was grown, the calcium content was 0.4% less, where barley and corn were grown – 1.6% less and where winter wheat was grown – 4.8% less and amounted to 116.0 mg.eq/kg.

The highest hydrolytic acidity was in the soil where winter rape was grown – 1.60 mg.eq/100 g. In the area where wheat was grown, the hydrolytic acidity was 0.63% less, where sunflower was grown – 1.24% less where maize was grown – by 1.25% less and where barley was grown - by 1.32% less and amounted to 0.28 mg.eq/100 g.

The saline pH was higher in the soil where the barley was grown - pH 7.0. On the plot where corn and sunflower were grown, the salt pH was 0.2% lower, where winter wheat was grown - 0.9% less and where winter rape was grown – 1.2% less and amounted to 5.8.

So, the soil where winter wheat was grown had the least humus and calcium content, but the largest – potassium.

The soil where the winter rape was grown was characterized by a high content of humus and calcium, high hydrolytic acidity, but a low content of hydrolyzed nitrogen, mobile forms of phosphorus and potassium, and low pH.

The area where the corn was grown had a high content of mobile phosphorus, and the sunflower had a high content of hydrolyzed nitrogen.

With the use of resource-saving chemicalization technologies, a high humus content was observed in the soil where winter wheat was grown – 3.4%.

In the area where sunflower was grown, the humus content was 0.2% less, where peas were grown – 0.4% less, barley – 0.5% less and where soybeans were grown – 1.1% less and amounted to 2, 3%.

The soil on which the barley was grown had the lowest hydrolytic acidity and the highest pH.

The high content of hydrolyzed nitrogen was in the soil where winter wheat, barley and sunflower were grown – 77.0 mg/kg. In the area where peas were grown, the content of hydrolyzed nitrogen was 0.7% less and where soybeans were grown – 1.4% less and amounted to 63.0 mg/kg. The high content of mobile phosphorus was in the soil where peas were grown – 249.0 mg/kg. In the area where soybeans were grown, the content of mobile phosphorus was 1.3% less, where sunflower was grown – 8.3% less, where barley was grown - 16.6% less and where winter wheat was grown – 19.5% less and amounted to 54.0 mg/kg.

The high content of mobile potassium was in the soil where sunflower was grown – 94.0 mg/kg. In the area where peas were grown, the content of mobile potassium was 0.4% less, where soybeans were grown – 2.9% less, where winter wheat was grown – 4.5% less and where barley was grown – 4.6% less and amounted to 48.0 mg/kg.

A high content of calcium was in the soil where winter wheat was grown – 96.0 mg.eq/kg. In the area where peas were grown, the calcium content was 0.1% less, where sunflowers were grown - 0.6% less, where soybeans were grown – by 1.0% and where barley was grown – 2.6% less and amounted to 70, 0 mg. eq./kg.

The highest hydrolytic acidity was in the soil where barley was grown - 3.48 mg. eq./100 g. In the area where winter wheat and sunflower were grown, hydrolytic acidity was 2.7% less, where soybeans were grown - by 3.0% less and where peas were grown – by 3.2% less and amounted to 0.31 mg. eq./100 g.

The saline pH was higher in the soil where the peas were grown – 7.2. In the area where soybeans were grown, the saline pH was 0.8% lower, where winter wheat and sunflower were grown – 1.0% less and where barley was grown – 2.2% less and amounted to 5.0.

So, the soil where winter wheat was grown had the lowest content of mobile phosphorus, but the highest – calcium.

The soil where the barley was grown was characterized by a high value of hydrolytic acidity, but a low content of mobile potassium.

The soil on which the sunflower was grown had a high content of mobile potassium. The soil on which soybeans were grown had the lowest humus and hydrolyzed nitrogen content.

The soil on which the peas were grown had the lowest hydrolytic acidity, but the highest pH and mobile phosphorus content.

So, in fact, fluctuations in the agrochemical parameters of soils depended on the culture of the field and the predecessor in the crop rotation. In particular, in terms of agrochemical parameters, the soil of the field where winter wheat was grown at a resource-saving level of chemicalization of agriculture had the lowest humus and calcium content, but the highest content of mobile potassium. This indicates the processes of soil degradation, depletion of organic matter. The soil of the field where winter rape was grown, on the contrary, was characterized by a high content of humus, calcium, high hydrolytic acidity, but low nitrogen content, easily hydrolyzed by mobile forms of phosphorus and exchangeable potassium, which indicates the peculiarities of the rapeseed culture and its effect on the soil condition.

The ecological state of the soil of the field where winter wheat was grown due to the intensive level of chemicalization of agriculture had the lowest content of mobile phosphorus, but the highest - calcium, which led to an effect on the pH of the soil environment. It was found that the soil on which the sunflower was grown had a high content of mobile potassium and the lowest content of available forms of phosphorus, which indicates a high requirement of this crop for phosphorus nutrition. But this negatively affects the condition of the soil and subsequent crops.

Maximum concentration limit for lead in soil is 6.0 mg/kg. Under conditions of intensive chemicalization, a high content of lead was found in the soil where winter rape and corn were grown - 0.03 mg/kg, which is 200 times less than the MPC, and in other cases – 0.02 mg/kg, which is 300 times less MPC (Table 1).

MPC of cadmium in soil is 0.7 mg/kg. A high content of cadmium was found in the soil where winter rape was grown - 0.11 mg/kg, which exceeded the MPC by 1.6 times, and in other cases, the cadmium content was 0.02 mg/kg, which is 35 times less than the MPC.

Maximum concentration limit of copper in soil is 3.0 mg/kg. A high copper content was found in the soil where winter rape was grown - 0.2 mg/kg, which is 15 times less than the MPC, and in other cases – 0.1 mg/kg, which is 30 times less than the MPC.

The maximum concentration limit for zinc in soil is 23.0 mg/kg. A high zinc content was found in the soil where winter rape was grown – 2.36 mg/kg, which is 9.7 times less than the MPC, where winter wheat was grown – 1.59 mg/kg, which is 14.5 times less than the MPC. where corn was grown – 1.35 mg/kg, which is 17.0 times less than the MPC, where sunflower was grown – 1.23 mg/kg, which is 18.7 times less than the MPC and where barley was grown – 0.86 mg kg , which is 26.7 times less than the MPC.

Table 1.

The content of mobile forms of heavy metals in soils of agrocenosis
(averaged data, 2018–2019)

Culture name	Heavy metal content, mg / kg							
	Pb		Cd		Cu		Zn	
	fact.	MPC	fact.	MPC	fact.	MPC	fact.	MPC
Winter wheat	0,02	6,0	0,02	0,7	0,1	3,0	1,59	23,0
Winter rape	0,03		0,11		0,2		2,36	
Spring barley	0,02		0,02		0,1		0,86	
Corn	0,03		0,02		0,1		1,35	
Sunflower	0,02		0,02		0,1		1,23	

So, the soil where winter wheat was grown had the permissible content of lead, cadmium, copper and zinc, did not exceed the MPC.

The soil where the winter rape was grown was characterized by a high content of cadmium, copper and zinc.

The soil on which the barley was grown had the lowest zinc content.

The soil on which the corn and sunflower were grown had the permissible content of lead, cadmium, copper and zinc, did not exceed the MPC.

Under the conditions of resource-saving chemicalization on all soils, the lead content in the soil was 0.01 mg / kg, which is 600 times less than the MPC (Table 2).

A high content of cadmium was found in the soil where barley and sunflower were grown - 0.08 mg/kg, which is 8.8 times less than the MPC, where soybeans were grown – 0.02 mg/kg, which is 35 times less than the MPC, and other options – 0.1 mg/kg, which is 70 times less than the MPC.

A high copper content was found in the soil where soybeans were grown – 1.0 mg/kg, which is 3 times less than the MPC, where sunflower was grown – 0.86 mg/kg, which is 3.5 times less than the MPC where winter wheat was grown – 0.82 mg/kg, which is 3.6

times less than the MPC, where barley was grown – 0.77 mg/kg, which is 3.9 times less than the MPC and where peas were grown – 0.68 mg/kg, which is 4.4 times less than the MPC.

Table 2.

The content of mobile forms of heavy metals in soils of agrocenosis
(averaged data, 2018–2019)

Culture name	Heavy metal content, mg / kg							
	Pb		Cd		Cu		Zn	
	fact.	MPC	fact.	MPC	fact.	MPC	fact.	MPC
Winter wheat	0,02	6,0	0,02	0,7	0,1	3,0	1,59	23,0
Spring barley	0,03		0,11		0,2		2,36	
Sunflower	0,02		0,02		0,1		0,86	
Soy	0,03		0,02		0,1		1,35	
Peas	0,02		0,02		0,1		1,23	

A high zinc content was found in the soil where barley was grown – 6.8 mg/kg, which is 3.4 times less than the MPC where sunflower was grown – 6.5 mg/kg, which is 3.5 times less than the MPC where they were grown soybeans – 4.7 mg/kg, which is 4.9 times less than the MPC, where peas were grown – 3.8 mg/kg, which is 6.0 times less than the MPC and where winter wheat was grown – 3.6 mg/kg, which is 6.4 times less than the MPC.

So, the soil where winter wheat was grown had the lowest cadmium and zinc content.

The soil where the barley was grown was characterized by a high content of cadmium and zinc.

The soil on which the sunflower was grown had a high cadmium content.

The soil on which the soybeans were grown had a high copper content.

The soil on which the peas were grown had the lowest cadmium and copper content.

Comparison of fertility and toxicity indices of dark gray podzolized soils, where measures of intensive and resource-saving chemicalization were used in the cultivation of agricultural plants, showed the following:

- the content of humus in dark gray podzolized soils under conditions of intensive chemicalization was 2.3-4.4%, and by resource-saving chemicalization it was 1.3% less;

- the content of hydrolyzed nitrogen in dark gray podzolized soils under conditions of intensive chemicalization was 63.0-98.0 mg/ g, and for resource-saving chemicalization it was 2.1% less;

- the content of mobile phosphorus in dark gray podzolized soils under conditions of intensive chemicalization was 159.0-319.0 mg/kg, and for resource-saving chemicalization it was 8.8% less;

- the content of mobile potassium in dark gray podzolized soils under conditions of intensive chemicalization was - 100.0-239.0 mg/kg, and for resource-saving chemicalization by 9.9%;

- the calcium content in dark gray podzolized soils under conditions of intensive chemicalization was 116.0-164.0 mg.eq/kg, and with moderate chemicalization it was 5.3% less;

- the value of hydrolytic acidity in dark gray podzolized soils under conditions of intensive chemicalization was 0.35-1.60 mg.eq/100 g, and for resource-saving chemicalization by 0.75% more;

- pH value in dark gray podzolized soils under conditions of intensive chemicalization was 5.8-7.0, and for resource-saving chemicalization by 0.3% more;

- lead content in dark gray podzolized soils under conditions of intensive chemicalization was 0.02-0.03 mg/kg, and for resource-saving chemicalization by 0.1% more;

- the content of cadmium in dark gray podzolized soils under conditions of intensive chemicalization was 0.02-0.11 mg/kg, and for resource-saving chemicalization by 0.1% less;

- the copper content in dark gray podzolized soils under conditions of intensive chemicalization was 0.1-0.2 mg / kg, and for resource-saving chemicalization by 0.1% more;

- the zinc content in dark gray podzolized soils under conditions of intensive chemicalization was 0.86-2.36 mg/kg, and for resource-saving chemicalization – 3.6-6.8 mg/kg, which is 3.5% more.

The residual content of pesticides (γ - HCH, DDT) in dark gray podzolized soils during the cultivation of winter wheat, spring barley, sunflower, soybeans and peas was determined (Table 3).

Table 3.

The residual content of pesticides in dark gray podzolized soils during the cultivation of basic agricultural crops under the conditions of intensive and resource-saving chemicalization of the Right-Bank Forest-Steppe (average for 2018–2019)

Culture name	Pesticide content, mg/kg			
	γ – GHCG		DDT	
	fact.	MPC	fact.	MPC
Winter wheat	<0,02	0,5	<0,02	0,2
Spring barley	<0,02		<0,02	
Sunflower	<0,02		<0,02	
Soy	<0,02		<0,02	
Peas	<0,02		<0,02	

According to the research results, it was found that the residual amount of pesticides in dark gray podzolized soils during the cultivation of basic agricultural crops under conditions of intensive and resource-saving chemicalization of agriculture was significantly lower than the MPC - less than 0.02 mg/kg γ – HCH at the MPC 0.5 mg/kg and less than 0.02 mg/kg DDT with an MPC of 0.2 mg/kg, which is less than the device error.

It was found that in the conditions of intensive and resource-saving chemicalization of agriculture, the accumulation of pesticide residues γ - HCH and DDT in dark gray podzolized soils was not found.

So, according to the results of assessing the state of food photographs of agroecosystems of the Right-Bank Forest-Steppe at different levels of chemicalization of agriculture, it was found that, in fact, fluctuations in agrochemical parameters of the soil depended on the specific agrocenosis of the crop and the predecessor in crop rotation, and the content of mobile forms of heavy metals (lead, copper, cadmium, zinc), residues organochlorine pesticides differed within the margin of error and did not exceed their maximum permissible concentration.

REFERENCES:

1. Dobryak D.A., Classification and ecological use of agricultural lands / DA Dobryak. Good man. M .: Knowledge, 2001. 309 p.

2. Ride N.M., Environmental assessment of agrobiocenoses: theory, methodology, practice / NM. Ride, V.P. Strokal, Yu.V. Rybalko. - Kherson: Publishing house "Oldie-plus", 2011. 568 p.

3. On the state of soil fertility in Ukraine. Kiev, 2010. URL: file: /// C: /Users/admin/Desktop/stan_gruntiv.pdf.

4. Klimenko N. A., Borisyuk B. V., Kolesnik T. N. Balanced use of land resources: textbook. allowance. Kherson: OLDI-PLUS, 2014.552 p.

5. Furdychko A.I. Ecological foundations of balanced development of the agrosphere in the context of the European integration of Ukraine: monograph. Kiev: DIA, 2014. 432 p.

6. Tarariko A.G., Emelnova Zh. L., Ilyenko T.V., Kuchma T.L. Formation of the agrosphere of Ukraine according to the principles of the Rio conference. Ecological Bulletin. 2014. No. 4. S. 26-28.

7. Khilko M.I. Environmental safety of Ukraine: textbook. Kiev, 2017. 267 p.

8. Mazur V.A., Vradiy A.I. Monitoring of soil pollution by heavy metals at the research site in the NDG "Agronomichnoe", Vinnytsia National Agrarian University. Agriculture and forestry. 2019. No. 13. S. 16-24.

9. Radionuclide contamination of agricultural land, URL: http://www.iogu.gov.ua/monitorynh-obiektiv-dovkillya/radionuklidy.

10. Gutorov A.I. Problems of sustainable land use in agriculture: theory, methodology, practice: monograph. Kharkov: KhNAU, 2010. 405 p.

11. DSTU ISO 10381-1: 2004. Soil quality. Sample selection. Part 1. Guidance on the design of sampling programs. [Introductions 2006.04.01]. K.: Derzhspozhivstandart of Ukraine, 2006. 36 p.

12. DSTU 4289: 2004. Soil quality. Methods for the determination of organic matter. [Introductions 2008.01.01]. K.: State Consumer Standard of Ukraine, 2008. 16 p.

13. DSTU 4770: 2007 Soil quality. Determination of the content of mobile manganese compounds (zinc, cadmium, iron, cobalt, copper, nickel, chromium, lead) in the soil in a buffered ammonium acetate extract with pH 4.8 by atomic absorption spectrophotometry. [Introductions 2009.01.01]. K.: Derzhspozhivstandart of Ukraine, 2009. 117 p.

14. Methods for determining the composition and properties of soils. S. A. Balyuk, V. A. Barakhtyan, M. E. Lazebnaya; ed. Balyuka S.A. Kh., 2004.S. 193-210.376.

15. 15. DSTU ISO 10390: 2001 Soil quality. Determination of pH. [Introductions 2003.01.01]. K. Gosstandart of Ukraine, 2003. 14 p.

16. Gritsaenko S.M., Gritsaenko A.A., Karpenko V.P. Methods of biological and agrochemical studies of plants and soils. Moscow: ZAO Nachalova, 2003. 320 p.

17. DSTU 7537: 2014 Soil quality. Determination of hydrolytic acidity. [Introductions 2015.01.01]. K. Ministry of Economic Development of Ukraine, 2015. 10 p.

18. DSTU 7863: 2015 Soil quality. Determination of easily hydrolyzed nitrogen by the Cornfield method. [Introductions 2016.01.01]. K. UkrNDNTS, 2016. 9 p.

19. DSTU 4115-2002 Soils. Determination of mobile compounds of phosphorus and potassium according to the modified Chirikov method. [Introductions 2003.01.01]. K. Gospotrebstandart of Ukraine, 2003. 12 p.

20. Yakovets L.A., Vatamanyuk A.V. Peculiarities of the accumulation of lead and cadmium in grain of cereal crops during storage. Organic agricultural production: education and science: Collection of abstracts of the International Scientific and Practical Conference (Kiev, November 1, 2018). Kiev, 2018.S. 69-71.

21. Musluva T.N. Copper in the soils of Zhytomyr Polesie. Bulletin of the Zhytomyr National Agroecological University. Scientific and theoretical collection. 2010. No. 2 (27). S. 30-45.