

**PART I – PEDOLOGY, AGROCHEMISTRY, BIOTECHNOLOGY,  
PLANT PROTECTION**

**AGROCHEMICAL STATE OF SOILS ON THE AGRICULTURAL LAND WITH  
CONSERVATIVE TILLAGE OF THE FIELD SCHOOLS FOR FARMERS**

NICOLAI LEAH\*

**ABSTRACT**

The agrochemical parameters of the soils were analyzed on the fields with conservative no-till and mini-till in 10 field schools. The parameters of the agrochemical indices define the level of the effective fertility of the soils, which in turn are very different and depend on the genesis and their form of degradation. In the Republic of Moldova, the humus content in the arable layer (0-30 cm) of soil varies from 0.8-1.2% (very degraded soil) to 4.2-5.0% (full profile soil), mobile phosphorus - from 0.6-0.8 mg to 6-8 mg/100g of soil and potassium exchangeable - from 14-16 mg to 50-60 mg/100g of soil. According to the classification of soils for chernozem with a humus content of 3.1-4.0%, mobile phosphorus ( $P_2O_5$ ) of 3.1-5.0 mg/100g and potassium ( $K_2O$ ) of 20.1-30.0 mg/100g of soil in the arable layer (0-30 cm) is optimally insured. Soils with less than 2% humus, less than 1.5-2.0 mg/100 g of mobile phosphorus and potassium less than 10 mg/100 g of soil have a low effective fertility. The soils of high and very high humus, mobile phosphorus and exchangeable potassium have a high potential for effective fertility, on these soils high crops can be obtained. For lands of each school, recommendations for improving the quality status and nutrients regimes of the soils were given.

**Key words:** conservative agriculture, soil quality, agrochemical indices, humus

**Introduction**

The Republic of Moldova is in the area of risk of droughts, which occur more frequently and significantly reduce the productivity of agricultural crops. Conserving soil moisture, increasing soil water yield is one of the priorities of raising the level of crops. Conservative agriculture (CA) includes a number of complementary agricultural practices that reduce the impact of drought and improve soil fertility: minimal soil disturbance (through a reduced tillage system or direct sowing in stubble) to preserve the structure, fauna and soil organic matter; permanent soil cover (cover crops, residues and mulch) to protect the soil from compaction and erosion, to preserve water and stabilize the temperature in the soil, to prevent weed growth; various crop rotations and combinations that stimulate soil microorganisms and eliminate plant pests, weeds and diseases.

Conservative agriculture aims to increase agricultural production by optimizing the use of agricultural resources and by helping to reduce the widespread degradation of land through integrated management of soil, water and biological resources combined with external raw materials. Mechanized tillage is minimized or replaced by biological soil mixing, soil microorganisms, soil roots and fauna taking over the function of working and balancing

soil nutrients. Soil fertility (nutrients and water) is controlled by soil cover management, crop rotation and weed control.

The implementation of the CA is carried out by organizing field schools for farmers, by creating demonstration plots with minimal tillage. Conservative agriculture is applied, first of all on demonstration plots, in the following stages, each of them having a duration of at least two years.

- *The first stage:* the inversion of the layers is stopped, applying instead a reduced system of soil works or direct sowing in the stubble. At least one third of the soil surface must remain covered with crop residues and cover crops must be introduced after harvesting the main crop. Disc tooth or rotary harrows are used (direct sowing in the case of direct sowing techniques in stubble). In the first stage, crop productivity may decrease.

- *The second stage:* the condition and fertility of the soil improve naturally due to the organic matter coming from the natural degradation of the residues. Weeds and pests tend to multiply and this must be controlled chemically or by other means.

- *The third stage:* the diversification of the cultivation method (crop rotation) can be introduced. The general system is gradually stabilizing.

- *The fourth stage:* the agricultural system is balanced and productivity can be improved compared to traditional agriculture. This process

\*"Nicolae Dimo" Institute of Pedology, Agrochemistry and Soil Protection, MD-2070, Chișinău, str. Ialoveni, 100, nicolai.leah@gmail.com

reduces the need to use chemicals to control weeds and pests or to increase fertility.

Farmers must be trained for each stage. Experience in the field can be gained, but productivity and profits can be lower in the short term. The system is not suitable for compacted soils, which may require loosening first. On compacted soils, a loosening with the scarified (chisel) at a depth of 35-45 cm is recommended every three years.

#### Material and method

The research materials served the soils of the demonstration plots of 10 field schools for farmers located in different pedoclimatic areas of the Republic of Moldova. The agrochemical parameters of the soils with conservative agriculture were compared: ploughing and mini-till. As an example of evaluating the chemical (agrochemical) properties of the 0-30 cm soil layer on the observation plots, in this paper, the IPAPS field school "N. Dimo" from Ivancea commune, Orhei district was taken (SCF IPAPS "N.Dimo"). Variant 1. Demonstration plot with mini-till; Variant 2. Demonstrative lot with ploughing.

The 6 mixed soil samples were collected and analyzed. Soil agrochemical indices were analyzed according to the methods. Soil sample preparation - GOST 5180-84; Humus - Tiurin method, GOST 26213-84; Mobile phosphorus - Macighin method, GOST 26205-84; Exchangeable potassium - Macighin method, GOST 26205-84; Nitric nitrogen

- Grandvali-Leaju method with phenoldisulfonic acid; Soil reaction (pH) - potentiometric method in aqueous extract, GOST 26483-85.

#### Results and discussions

The parameters of agrochemical indices define the level of effective soil fertility, which in turn are very different and depend on their genesis and form of degradation. In the Republic of Moldova the humus content in the arable layer (0-30 cm) of soil varies from 0.8-1.2% (very degraded soil) to 4.2-5.0% (full profile soil), mobile phosphorus - from 0.6-0.8 mg to 6-8 mg/100g of soil and exchangeable potassium - from 14-16 mg to 50-60 mg/100g of soil (4, 5, 6).

According to the soil classification the chernozems with humus content of 3.1-4.0% mobile phosphorus ( $P_2O_5$ ) of 3.1-5.0 mg/100g and potassium ( $K_2O$ ) of 20.1-30.0 mg/100g of soil in the arable layer (0-30 cm) is optimally ensured (Table 1). Soils with less than 2% humus content, less than 1.5-2.0 mg/100 g of mobile phosphorus and less than 10 mg/100g of soil potassium have poor effective fertility. Soils with high and very high content of humus, mobile phosphorus and exchangeable potassium have a high potential for effective fertility on these soils high yields can be obtained.

The results of the agrochemical researches from 2020 of the two demonstration fields of SCF IPAPS "N. Dimo", Ivancea com., Orhei district are presented in Table 2.

**Table 1 - Classification of soils according to humus and NPK content in the arable soil layer (3)**

Soil insurance class	Humus, %	Mobile phosphorus ( $P_2O_5$ ), <i>Macighin method</i>			Exchangeable potassium ( $K_2O$ )		Nitric nitrogen (N- $NO_3$ )
		<i>Chernozioms</i>		<i>Gray soils</i>	<i>Ciricov</i>	<i>Macighin</i>	
		<i>carbonatic. ordinary. tipical</i>	<i>leaced. argillic</i>				
mg/100 g sol							
1. Very low	less 1.1	less 1.1	less 1.6	less 2.1	less 5.1	less 5	less 0.5
2. Low	1.1 - 2.0	1.1 - 1.5	1.6 - 2.0	2.1 - 2.5	5.1 - 10	5.1 - 10	0.6 - 1.2
3. Moderate	2.1 - 3.0	1.6 - 3.0	2.1 - 3.5	2.6 - 4.0	10.1 - 15	10.1 - 20	1.3 - 1.9
4. Optimal	3.1 - 4.0	3.1 - 4.5	3.6 - 5.0	4.1 - 5.5	15.1 - 20	20.1 - 30	2.0 - 2.6
5. High	4.1 - 5.0	4.6 - 6.0	5.1 - 6.5	5.6 - 7.0	20.1 - 25	30.1 - 40	2.7 - 3.3
6. Very high	over 5.0	over 6.0	over 6.5	over 7.0	over 25	over 40	over 3.3

**Table 2 - The parameters of the soils chemical properties of the demonstration plots**

Depth. cm	pH ( $H_2O$ )	Humus, %	Phosphorus ( $P_2O_5$ )	Potassium ( $K_2O$ )	Nitric nitrogen (N- $NO_3$ )
			mg/100g of soil		
<b>Demonstration plot 1. Mini-till</b>					
0-10	7.60	3.53	3.0	36	0.36
10-20	7.72	3.0	0.6	24	0.14
20-30	7.87	2.88	0.5	21	0.14
<b>0-30</b>	<b>7.73</b>	<b>3.14</b>	<b>1.37</b>	<b>27</b>	<b>0.21</b>
<b>Demonstrative plot 2. Ploughing</b>					
0-10	6.74	3.52	3.1	38	0.32
10-20	6.80	3.32	0.8	26	0.12
20-30	6.82	3.0	0.7	24	0.16
<b>0-30</b>	<b>6.79</b>	<b>3.28</b>	<b>1.53</b>	<b>29</b>	<b>0.20</b>

It was found that the parameters of agrochemical indices in the arable layer (0-30 cm) on the demonstration fields vary within the following limits: soil reaction (pH): from 6.74 to 7.87 units; humus: from 2.88% to 3.53%; mobile phosphorus: from 0.5 mg to 3.1 mg P<sub>2</sub>O<sub>5</sub> in 100 g of soil; exchangeable potassium: from 21 mg to 38 mg K<sub>2</sub>O in 100 g of soil; nitric nitrogen content: from 0.12 to 0.36 mg N in 100 g of soil.

Soil reaction (pH) is an index which characterizes the soil reaction - the acid-alkaline properties of the soil-plant system. The concentration of free H<sup>+</sup> ions expresses the magnitude of the pH defined by the negative logarithm of the concentration of hydrogen ions. Soil pH values equal to 7 units characterize their reaction as neutral pH <7 - acidic and pH > 7 - basic (alkaline). Crops react differently to soil pH. The most favorable is the reaction of the soil between slightly acidic to neutral and weakly alkaline to neutral. A negative impact on plant development has the reaction of strongly acidic soil solutions (pH <4) and especially - strongly alkaline (pH > 9).

The soil pH on the demonstration plot with mini-till is weakly alkaline (7.60-7.87), on the demonstration plot with ploughing it is weakly acidic (6.74-6.82) in the soil layer 0- 30 cm. The weakly alkaline reaction of the soil with mini-till is due to the application of wastewater from the pig complex at a dose of 80 t/ha. The average soil pH is 7.73 units per lot with mini-till and 6.79 units per lot with ploughing (Table 2).

Therefore the soil pH of the demonstration plots of SCF IPAPS „N.Dimo” are favorable for the growth of agricultural crops and will not limit the level and quality of crops.

Humus is one of the main indicators of soil fertility. It contains about 94-96% nitrogen, 40-45% phosphorus, 60-70% sulphur etc. of the total amount of soil. The humus content largely determines the agro- physical, chemical and biological properties of the soil, provides agricultural plants and soil biota with mineral nutrition. The higher the humus content, the better the plants are provided with nutrients. Increasing the humus content by 1% ensures the obtaining of an additional 1.0 t/ha of corn or 0.8 t/ha of winter wheat (1, 3).

On the investigated demonstration fields, the humus content in the arable soil layer varies depending on the natural peculiarities of the solification and the erosion process. The humus content in the layer of 0-30 cm of soil on the demonstration plot (mini-till) is within the limits of 2.88-3.53%, on the traditional work (ploughing) - 3.0-3.52% and the average amount of humus is 3.14-

3.28% (Table 2). According to the soil classification (Table 1) the amount of humus of 3.14-3.28% corresponds to the optimal insurance class.

Experimentally was determined (4) that in the process of mineralization of the organic matter in the soil, 1% of humus produces on average 24 kg/ha of nitrogen per year. It follows that depending on the humus content in the soil, the productive level of the soil and the need for nitrogen fertilizers to obtain the expected yields can be forecast (Table 3).

The average humus content of 3.14-3.28% of the soil of the demonstration fields will provide annual nitrogen crops with an average of about 75-79 kg/ha. This amount of nitrogen is sufficient to obtain harvests of 2.3-2.8 t/ha of winter wheat. In order to obtain higher yields, it will be necessary to apply additional nitrogen fertilizers and organic fertilizers.

Most of the Moldovan soils are characterized by a low content of mobile phosphorus (P<sub>2</sub>O<sub>5</sub>) forms accessible to plants. The content of mobile phosphorus in full-profile non-fertilized soils is 1.0-1.5 mg per 100 g of soil. During the chemicalization period (1970-1990) due to the systematic application of fertilizers, the phosphorus regime in some households improved considerably (6). In the last 30 years in the republic, phosphorus fertilizers are practically not applied, only partially in some households under more profitable crops (vegetables, sugar beet, etc.). As a result, the reserves of mobile phosphorus accumulated in the soil during the intensive chemicalization decrease, returning to the natural background. The results obtained regarding the amount of mobile phosphorus in the arable soil layer (0-30 cm) for the researched demonstration fields are presented in Table 2.

The content of mobile phosphorus in the demonstration field (mini-till) in the 0-30 cm soil layer varies from 0.5 mg to 3.0 mg/100 g soil. On the demonstration field with classical tillage system (ploughing), the content of mobile phosphorus in the arable layer is within the limits of 0.7-3.1 mg/100g soil. Phosphorus content in the other depths 10-20 and 20-30 cm for both systems remaining at the natural concentration of 0.5-0.8 mg/100g mobile phosphorus soil. The average value of mobile phosphorus content in the 0-30 cm soil layer is 1.37 mg with the mini-till tillage system and 1.53 mg/100g soil with traditional ploughing system (Table 2). According to the soil insurance gradation (Table 1) the demonstration fields of SCF IPAPS „N. Dimo” have a very low mobile phosphorus content.

Therefore, the very low content of mobile phosphorus in the soil on the lands of SCF IPAPS

„N.Dimo” will limit the level and quality of crops. Measures will need to be taken to radically improve the phosphorus regime in the soil by applying phosphorus fertilizers over time.

The soils of the Republic of Moldova are rich in potassium, especially those with heavy particle size composition. The main reserve of potassium accessible to plants is presented in the changeable form. It is largely restored based on the breakdown of potassium-containing minerals in the soil. According to agrochemical research data, up to 90% of the republic's soils contain more than 20 mg, 64% - more than 30 mg and 23% - more than 40 mg of  $K_2O$  in 100 g of soil in exchangeable form (6). It is already established that in Moldova field crops react positively to the application of potassium fertilizers, when the exchangeable potassium content in the soil is less than 20 mg per 100 g of soil, and for beets, potatoes, vegetables and fruit trees - more less than 25 mg (2).

According to the investigations, the exchangeable potassium content in the 0-10, 20-30 and 20-30 cm soil layers of the demonstration fields of SCF IPAPS „N. Dimo” varies from 21 mg to 38 mg/100 g soil. According to the insurance gradation, the level of exchangeable potassium varies from optimal to high. The average in the 0-30 cm soil layer is 27-29 mg/100 g of soil corresponding to the fields (Table 2). According to the soil classification, soils with a changeable amount of potassium of 27-29 mg/100 g of soil are optimal insurance (Table 1).

Therefore, the soil of the demonstration fields with the optimal content of exchangeable potassium are provided with this nutrient for the growth and development of agricultural crops. We consider that for a period of 5-7 years the state of potassium supply of these soils will not limit the obtaining of high yields.

The main source of nitrogen in the soil, which determines the nutrition of plants is nitrates. Nitric nitrogen is found in the soil in the form of water-soluble salts. Nitrogen can be, both of mineral origin from mineral fertilizers and organic from humus, organic fertilizers (manure etc.), but also from the atmosphere, produced by symbiotic bacteria - nitrogen fixers with legume crops.

The content of nitric nitrogen in the soil depends a lot on the nitrification capacity of the soil as well as on the amount of nitrogen remaining after the previous crops. Nitrification is a process of reducing nitrogen-containing organic compounds from soil to nitrates by nitrifying bacteria. The nitrification capacity of the soil largely depends on the amount of organic matter in the soil, on the vitality of the soil biota. The higher the nitrification

capacity, the more nitric nitrogen is found in the soil and is accessible to plants.

Within the SCF IPAPS „N.Dimo” nitric nitrogen content in soil layers 0-10, 20-30 and 20-30 on the demonstration fields varies from 0.12 mg to 0.36 mg  $N-NO_3$  in 100 g soil. The average being 0.20-0.21 mg/100 g of soil - very low insurance class for both lots (Table 2). Converted into reserve, the amount of nitric nitrogen in the arable soil layer will be about 7 kg/ha nitrogen. Under optimal conditions of humidity and temperature, the amount of nitric nitrogen in the soil produced by nitrifying bacteria in the fields will increase according to the humus content in the soil. Therefore, the nitrogen nutrient regime of the soils of the demonstration fields is in the first place. As a result of agrochemical research, it was established that from the researched nutritional regimes (nitrogen, phosphorus, potassium) of soils in SCF IPAPS „N.Dimo” in the first minimum is nitrogen and phosphorus.

*Nitrogen.* Leached chernozem within SCF IPAPS „N.Dimo” with an average humus content of 3.14-3.28% will provide agricultural crops with annual nitrogen on average 75-79 kg per 1 ha. This amount of nitrogen is sufficient to obtain a harvest of 2.3-2.8 t/ha of winter wheat. but to obtain crops of 4.5-5.0 t/ha of autumn wheat for baking (22-24% gluten) and 6.0-6.5 t/ha ha corn for grain on a background without organic fertilizers, when the share of legume crops is low, it is necessary to incorporate in the soil 115-120 kg/ha nitrogen, about 335-350 kg/ha ammoniac siliter (Table 3).

The need for nitrogen fertilizers will depend on the agro-climatic conditions of each year and the level of crops. Doses of nitrogen fertilizers for agricultural crops are recommended to be determined in the spring, depending on the need for the crop and nitric nitrogen reserves in the active area (0-100 cm) of the root system of plants. In order to obtain high and stable crops, measures are needed to regulate the nitrogen regime. First of all, it is necessary to increase the content of organic matter in the soil. This can be done by implementing scientifically argued crops with a share of legumes of 20-25% (alfalfa, sparceta, peas, beans, vetch, etc.), the application of manure and secondary agricultural production (straw, stems etc.).

*Phosphorus.* According to the phosphorus insurance gradation (Table 1) currently the soils of the demonstration fields have a very low content (1.37-1.53 mg/100g soil) of mobile phosphorus (Table 2). In order for the normal growth and development of agricultural crops to form a quintal of grains, wheat and corn for grains consume about

1.0-1.2 kg of P<sub>2</sub>O<sub>5</sub>. So, in order to obtain the harvest of 4.5-5.0 t/ha of winter wheat and 6.0-6.5 t/ha of corn, the export of phosphorus during the vegetation period will constitute about 60-65 kg/ha of phosphorus. Against the optimal background of mobile phosphorus in the soil the dose P<sub>60-65</sub> will be indicated to compensate the export of phosphorus with the annual harvests. However, for soils with a very low level of mobile phosphorus in the soil, it will be necessary to compensate the export of phosphorus with the annual production, as well as to raise the level of phosphorus in the soil over a period of time. In these fields in the next 4-5 years it is necessary to incorporate in the soil the dose of P<sub>100-120</sub> or P<sub>190-230</sub> kg/ha amophos (Table 4). After the stabilization of the optimal levels of phosphorus in the soil (year 2027), the export of phosphorus with the harvests will be compensated with the doses of P<sub>60-65</sub> or P<sub>15-125</sub> kg /ha amophos (mark 12:52). Thus, on the demonstration fields of SCF IPAPS „N. Dimo” radical measures will be taken to improve the phosphate regime in the soil, by applying phosphorus fertilizers in the next 4-5 years at a dose of 100-120 kg/ha.

*Potassium* regime in the researched soils are favorable for obtaining high yields. In the next 5-7 years the application of chemical fertilizers with potassium is not necessary. In order to maintain a equilibrated potassium balance, the annual export of K<sub>2</sub>O can be offset by crop residues and the secondary production of agricultural crops (spike, straw, maize stalks and sunflower). Being crushed and incorporated, the straw leaves in the soil about 70-80 k/ha K<sub>2</sub>O (each ton of wheat straw requires an additional 10 kg/t of nitrogen), corn stalks - 90-100 kg, sunflower stalks - 200-360 kg/ha K<sub>2</sub>O (5, 6). Soils with optimal exchangeable potassium content are optimally provided with this nutrient for the growth and development of agricultural crops. We consider that in the next 5-7 years the state of potassium supply of these soils will not limit the obtaining of high yields. Therefore, for the stable maintenance of the potassium regime on the demonstration fields of SCF IPAPS „N.Dimo” in a multi-annual cycle, local fertilizers can be used in optimal recommended doses: manure, compost, secondary agricultural production etc.

**Table 3** - Planned harvest of field crops and nitrogen fertilizer requirements for soils of SCF IPAPS „N. Dimo”

Humus. %	Soil nitrification capacity, N kg/ha	Predicted fertilizer-free harvest, t/ha			Planned crop harvest; required in nitrogen fertilizers, kg/ha		
		Autumn wheat	Corn grain	Sun flower	Wheat 4.5-5.0 t/ha	Corn 6.0-6.5 t/ha	Sun flower 2.7-3.0 t/ha
3.0	72	2.2-2.7	2.9-3.1	1.8-1.9	130	130	70
3.2-SCF	77	2.3-2.8	3.1-3.3	1.9-2.0	120	120	60
3.4	81	2.4-3.0	3.3-3.5	2.0-2.1	115	115	55
3.6	86	2.6-3.1	3.4-3.7	2.1-2.2	105	105	45
3.8	91	2.7-3.3	3.6-3.9	2.2-2.3	100	100	40
4.0	96	2.9-3.5	3.8-4.2	2.3-2.4	90	90	30

**Table 4** - The need for phosphorus fertilizers for the formation and stabilization of the optimal level of mobile phosphorus in SCF IPAPS soils „N.Dimo” in order to obtain the expected harvests in the years 2021-2027

Soil insurance class	Mobile phosphorus, mg/100 g soil	2021		2022		2023		2024		a.2025		a.2026		a.2027	
		kg/ha		kg/ha		kg/ha		kg/ha		kg/ha		kg/ha		kg/ha	
		P <sub>2</sub> O <sub>5</sub>	amo-phos	P <sub>2</sub> O <sub>5</sub>	amo-phos	P <sub>2</sub> O <sub>5</sub>	amo-phos	P <sub>2</sub> O <sub>5</sub>	amo-phos	P <sub>2</sub> O <sub>5</sub>	amo-phos	P <sub>2</sub> O <sub>5</sub>	amo-phos	P <sub>2</sub> O <sub>5</sub>	amo-phos
Very low	less 1.5	120	230	120	230	0	0	0	0	0	0	0	0	0	0
Low	1.6 - 2.0	0	0	0	0	120	230	100	190	0	0	0	0	0	0
Moderate	2.1 - 3.5	0	0	0	0	0	0	0	0	100	190	90	175	0	0
Optimal	3.6 - 5.0	0	0	0	0	0	0	0	0	0	0	0	0	60	115
High	5.1 - 6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very high	over 6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0

\* Amophos (12:52) with active substance content: N – 12%; P<sub>2</sub>O<sub>5</sub> – 52%.

### Conclusions

Within the SCF IPAPS “N.Dimo” the content of nitric nitrogen in the layer 0-30 cm of soil on the demonstration fields varies from 0.12 to 0.36 mg N-NO<sub>3</sub> in 100 g of soil. The average - constituting 0.20-0.21 mg N-NO<sub>3</sub> per 100 g. According to the

insurance grade, the average nitric nitrogen content is very low for both fields. Nitrogen nutrient regime of demonstration fields is in the first place.

As a result of agrochemical research, it was established that from the researched nutritional regimes (nitrogen, phosphorus, potassium) of soils in the first minimum is nitrogen and phosphorus.

In order to regulate the nitrogen regime it is recommended to increase the content of organic matter in the soil by implementing scientifically justified crop rotations with a share of legumes of 20-25% (alfalfa, sparceta, peas, beans, vetch etc.), application of manure and secondary agricultural production (straw, stalks, etc.). In order to obtain high and stable harvests at the first stage, it is recommended that nitrogen fertilizers be applied in the doses indicated in Table 3 until the implementation of the measures indicated above.

On both demonstration fields is recommended to take radical measures to improve the phosphate regime in the soil by applying phosphorus fertilizers in the next 4-5 years at a dose of 100-120 kg/ha according to the scheme (Table 4).

In order to maintain the potassium regime on the demonstration fields, it is recommended that in a multiannual cycle the local fertilizers be used in optimal recommended doses: manure, composts, vegetable residues and secondary agricultural production, etc. In order to homogenize the nutrients in the soil on the field with the mini-till of the soil is recommended once every 3-4 years of ploughing to a depth of 27-30 cm.

### Rezumat

Parametrii agrochimici ai solurilor au fost analizați pe câmpuri cu agricultură conservativă: no-till și mini-till în 10 școli pentru fermieri. Parametrii indicilor agrochimici definesc nivelul fertilității efective a solurilor, care la rândul lor sunt foarte diferiți și depind de geneza și forma lor de degradare. În Republica Moldova conținutul de humus în stratul arabil (0-30 cm) de sol variază de la 0.8-1.2% (sol foarte degradat) până la 4.2-5.0% (sol cu profil deplin), fosfor mobil – de la 0.6-0.8 mg până la 6-8 mg/100g de sol și potasiu schimbabil – de la 14-16 mg până la 50-60 mg/100g de sol. Conform clasificării solurilor pentru cernoziomuri cu conținutul de humus de 3.1-4.0%, fosfor mobil ( $P_2O_5$ ) de 3.1-5.0 mg/100g și potasiu ( $K_2O$ ) de **20.1-30.0** mg/100g de sol în stratul arabil (0-30 cm) este optim asigurat. Solurile cu conținut mai mic de 2% de humus, mai puțin de 1.5-2.0 mg/100 g fosfor mobil și potasiu mai puțin de 10 mg/100g de sol au o fertilitate efectivă slabă. Solurile terenurilor cu conținut ridicat și foarte ridicat de humus, fosfor mobil și potasiu schimbabil au un potențial mare al fertilității efective, pe aceste soluri se pot obține recolte înalte.

### References

1. ANDRIEȘ, S. V., 2007 - Optimizarea regimurilor nutritive și productivitatea plantelor de cultură.. Chișinău: Pontos, pp. 151-282.
2. ANDRIEȘ, S. (red. resp.), 2004 - PROGRAMUL complex de valorificare a terenurilor degradate și sporirea fertilității solurilor. Partea II. Sporirea fertilității solurilor. Chișinău: Pontos, 128 p.
3. RECOMANDĂRI privind aplicarea îngrășămintelor pe diferite tipuri de sol la culturile de câmp. – Chișinău: Pontos. 2012. – 68 p.
4. ГАЕНЕНКО, В.П., 1991 - Гумус почв Молдовы и его трансформация под влиянием удобрений. – Кишинев: «Штиинца». – 132 с.
5. КОРДУНЕАНУ, П.Н., 1978 - Круговорот основных элементов питания сельскохозяйственных культур. – Кишинев: «Штиинца». – 178 с.
6. ПОЧВЫ МОЛДАВИИ. Т.3. – Кишинев: «Штиинца». 1986. – 336 с.