CONCEPTUAL AND METHODOLOGICAL FRAMEWORK IN THE IMPLEMENTATION OF THE RESOURCE-CONSERVATIVE TECHNOLOGIES IN THE CARPATHO-DANUBIAN-PONTIC AREA

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Key words : Conceptual and methodological framework, implementation of the resource conservative technologies, Carpatho-Danubian-Pontic area.

Abstract. In agricultural regime react primarily the structure and apparent density of the soil.. These cause the soil porosity, therefore, pore space is a comprising index of physical change processes showing certain dependencies on the impact upon soil. In case of conventional agricultural soil working systems, based on ploughing, the physical degradation processes (compaction. dismantling) have major ratios and lead to the constitution of a faulty pore space in soil, which affects the processes of reproducing the chernozems type of pedogenesis. The alternative (conservative) tillage systems diminish the stratification, reduce soil profile stratification and ensure the stability as well as the continuity of pore space. During the whole year, the optimal conditions for ecosystem functioning and reproduction of soil type chernozem soil formation are created.

Assessment problem

Actually, it is widely recognized that the classic system of soil processing based on the annual tillage maintenance and germinative stratum preparation (by 1-3 disk working) along with the immediate positive but short effect, generates different negative processes with remnant consequences, which are felt every year.

Our generalizations showed that within this way of soil processing, associated with abundant mineral fertilization, the main crop harvests in R. Moldova (Winter wheat, maize, sunflower, sugar beet etc.) after the short phase of increasing from 1965 till 1973 – 1975 , fall into a reduction phase, which continues till our days (Jigău, Senic, 2008). More, crops are more susceptible to diseases and pests, to drought, natural disasters etc. All the above implies that the classic system of soil processing by solving economical problems, involves a number of new limiting factors, which deplete the enlarged reproductive capacity and

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bioproductive function, materialized in soil fertility. According to the factorial – processual concept of pedogenesis, soil fertility is not just a result of pedogenesis, but a condition for its realization (Jigău, 2005, 2007). This because namely the bioproductive function is the unique energy provider within pedogenesis, which ensures pedogenesis reproduction.

In the same time, the classic system of soil processing led to the intensification of some natural processes (erosion, dehumification, etc.), disturbance of the dynamic of soil compaction and of structural – aggregate state (tab. 1), as well as to the other degradation forms regarding chernozemic pedogenesis (tab. 2). More, it is proved that in the conditions of physical degradation, the mineral fertilization (and organic) doesn't affect the productivity of chernozems. Due to this, farmers appeal for the intensification of the agro-ecosystems, while this procedure led to the amplification of the physical degradation.

1. Methodical conceptual framework

By the agro-technical appearance, the conservative system of soil processing is a generic expression used to define different methods for soil purification for crops sowing. More broadly, this expression defines any agricultural system which is designed for its proper protection, namely, for reduction or even elimination of the aggressive factors of degradation versus the conventional system.

The introduction of these systems is determined by the fact that, on the one hand, conventional systems generated different negative processes and amplified the negative processes that lead to soil degradation (especially in the arable layer and in the agro-ecosystems intensely artificial), and, on the other hand, the techniques in the sphere of mechanization, performance in agricultural engineering are both, for purification and soil sowing.

Another important factor is the desire to promote biodiversity and to re-naturalize the processes of the soil. Therefore, the resource-economical technologies have a new alternative leading to the elimination (at least partially) of the risk factors and their negative consequences, and in the same time to the reduction of the difference between artificial agro-ecosystems and natural ecosystems. These do not involve the creation of some better conditions for crop cultivation as we expected. The basic objective of the resource-economical technologies consists primarily in the insurance of optimal reproduction and operation conditions, including seed germination, plant growth and development, crop production.

It is widely recognized that one universal available system of soil processing doesn't exist because of the local habitat differences, primarily the climate but also because of the technical endowment level.

Tab. 1 - Structuring state indexes of typical moderate humifere clayey-loamy chernozems

Regime	Depth, cm	Aggregate content, %			Content of hydro-stable aggregates, %			Apparent density, g/cm^3
		>10	10- 0.25	<0.25	>5	5- 0.25	<0.25	
Celery	0 – 10	6.3	85.6	8.1	27.0	52.0	21.0	1.03
	10 – 20	8.7	84.0	7.3	21.0	59.6	19.4	1.12
	20 – 30	11.3	79.2	9.5	23.6	58.2	17.6	1.23
Ploughed soil 53 years	0 – 10	13.9	73.6	12.5	7.4	53.0	39.6	1.19
	10 – 20	19.7	65.0	14.3	4.4	49.0	46.6	1.27
	20 – 30	31.7	58.2	10.1	11.8	41.9	46.3	1.39
	30 – 40	30.3	56.9	12.8	10.7	44.4	44.9	1.42
	40 - 50	17.8	69.8	12.4	10.9	52.0	37.1	1.47
Ploughed soil 47 years	0 – 10	12.5	68.0	19.5	7.7	52.0	40.3	1.08
	10 – 20	19.4	68.5	12.1	6.1	47.0	46.9	1.23
	20 – 30	30.7	58.0	11.3	9.7	42.0	48.3	1.36
	30 – 40	30.3	56.9	12.8	10.3	41.5	48.2	1.40
	40 - 50	14.7	73.0	12.3	9.1	47.9	43.0	1.48

Tab. 2 - The implications of physical degradation on pedogenetical environment regarding chernoziomic type of solification

No.	Pedogenetical implications
1	Modification of pore space caused by soil compaction and soil destructuring. Lead to aeration worsening, oxygen reduction and carbon dioxide increasing in the air of soil, accompanied by nitrate regime disturbance and decrease of the degree of nitrogen assimilation, phosphorus and potassium.
2	The stratification of the profile as a result of soil compaction is a cause of a low root penetration in depth and of the exploitation of a bigger volume of soil, so the risk of dryness increases as well as plant vulnerability on atmospheric dryness.
3	The degradation of the soil porosity regime as a result of compaction and de-structuring leads to biological activity decreasing.
4	The soil stratification causes the nutrient accumulation and eventual pollutants in the upper segment of the soil and increases the risk of crop pollution.
5	The reduction of the hydraulic conductivity and of the percolation depth leads to soil self pollution with products of bio/ and pedogenesis and have negative implications on crop quality.
6	Worsening of air-hydrological regime affects the sense, the intensity of decomposition processes of the organic substances and the nature of its final product.
7	The faulty regime of porosity leads to the worsening of gas exchange in the soil profile, but also between soil and environment and causes the accumulation of diverse toxins from bio/ pedogenesis processes and soil biota activity.

The resource – economical technologies in different areas (pedogeografic district) must have certain specific characteristics in relation to environmental features, crop characteristics, so they must be applied in different ways. In this context, the concept "resource – economical technologies" is extremely flexible and involves multiple possibilities of soil purification depending on the local specific conditions. The extension of this concept could be done just in function of the soil specificity and local general conditions, practicing different solutions as: to minimize the main depth of processing, replacement of tilling with the disk processing using the paraplow. Also, we can decrease the intensity of secondary processing for germinative layer preparation by reducing the number of operations, or by making more operations on one single pass of the agro machine, or by elimination of the most aggressive one.

Tab. 3 - Pedogenetical agents affecting the traits-self processes and soil regimes

Climate factors	Rock factors	Bio factors	Humus factors
1. Thermal contrast	1. Granulometric component of the rock	1. Quantity and composition of organic waste	1. Humus content and its composition
2. Rainfall quantity and the depth of wetting.	2. Rocks permeability for water	2. The mode and the storage of the organic waste	2. Content and composition of the retained cations.
3. Water reserves pedogenetically active.	3. Mineralogical composition of rocks and its degree of diversity.	3. Conditions and mechanisms of decomposition of organic waste.	3. Mineralogical composition of the finely dispersed fraction
4. Duration and depth of frost	4. Thermal features of the rocks (dilation, contraction, specific heat, etc.).	4. Penetration depth of root system and its type.	
5. Variability in time of the thermal regime of soils			

From this point of view, in the first selective stage of the resource – economical technologies, the impact of the extern factors (pedological) concerning the self-reproduction capacity (self-purification) materialized in the soil structure (tab. 3) is taken into account. The practicing of resource-economical technologies is favored by the chernozem trait of the region for realizing the bio- and pedoclimate natural potential and the strong capacity of self-production and self-adjusting of the traits and regimes of the soil materialized in self-structuring and self-purification. Therefore, for the soil suitability evaluation of the region in sense of using resource – economical technologies we can use: the granulometric component, mineralogical origin of the finely dispersed fraction, moisture regime, humus content, humifer thickness etc. The decisive role belongs to the granulometric component (tab. 4).

Tab. 4 - The implications of the granulometric composition on structural composition - aggregate of soil

The granulometric category	The physical clay content,%	Content < 0,001 mm,%	The mechanisms of Structuring	The structural composition of the aggregate
Refined sand Cohesive sand Sand clay	0-5 5-10 10-20	<1% <3% <5%	Not done	Soils are devoid of structure
Clay – sandy	20-30	5-15	Agglutination - Cementing	Poorly structured soils. Low Hydro-stability and cohesion. Low Reproductive capacity.
Clayey	30-45	15-25	Agglutination - Cementing. Pressing - other mechanical processes.	Poor soils and moderately structured. Low hydro-stability and cohesion. Low reproductive capacity.
Clay- argillaceous	45-60	25-30	Agglutination - coagulation - cementing. Pressing - other mechanical processes	Optimally structured and moderate soils. High and moderate hydro-stability and cohesion. High reproductive capacity
Argillaceous – clayey	60-75	30-45	Coagulation - cementing. Agglutination. Pressing - other mechanical processes.	Optimally structured and moderate soils. High and moderate hydro-stability and cohesion. High reproductive capacity
Argillaceous	> 75	>45	Coagulation - cementing. Pressing - other mechanical processes. Agglutination.	Optimally structured and moderate soils. High and moderate hydro-stability and cohesion. Low reproductive capacity

Tab. 5 - The soils behavior with different granulometric composition with different degree of moisture in any agricultural processing

The granulometric category. The Physical clay content.	Moisture rank	Plasticity	Adhesion	The resistance on penetration	The behavior to the agricultural operations	The behavior at the machine passing	Susceptibility to the degradation of structure
Clayey 30-45 %	Low wet	Absent	Absent	> 15 kg/cm²	Satisfactory	Satisfactory	Moderate
	Moistened	Minimal	Minimal	11-15 kg/cm²	Good	Good	Low
	Wet	Pronounced	Pronounced	< 11 kg/cm²	Unsatisfactory	Unsatisfactory	High - moderate
Clay- argillaceous 45-60 %	Low wet	Absent	Absent	> 20 kg/cm²	Satisfactory	Satisfactory	Moderate
	Moistened	Minimal	Minimal	11-15 kg/cm²	Good	Good	Low
	Wet	Pronounced	Pronounced	< 11 kg/cm²	Unsatisfactory	Unsatisfactory	High - moderate
Argillaceous – clayey 60-75 %	Low wet	Absent	Absent	> 25 kg/cm²	Unsatisfactory	Unsatisfactory	Moderate
	Moistened	Minimal	Minimal	13-12 kg/cm²	Good	Good	Low
	Wet	Pronounced	Pronounced	> 13 kg/cm²	Unsatisfactory	Unsatisfactory	High

In agricultural regime, the structuring effect about 50 % is determined by the processing quality and by the soil behavior in relation with the agricultural machines and aggregate. In this context, it is necessary to take into account the specified features (tab. 5).

3. Case study - The physical quality indices of the typical moderate humifere chernozem within different processing system

3.1. Objects and work methods. The following methods were used to monitor the dynamics of physical properties, with impact on the pore space, within various agricultural technologies:

- field experiments established for the study of technological systems with impact on soil physical properties;

Studies on production conditions, in different regions of the Republic of Moldova.

- the apparent density was determined on the field with the Kacinschi densitometer (measurements were made in five replicates). The structural aggregate state was evaluated by applying dry fractionation (the Savinov method).

The hydro-stability of the structural aggregates was determined using the Savinov method. Structural macro-aggregates content, with the equivalent diameter greater than 0.25 mm, stable to water action (expressed in % g/g of the content of air-dried aggregates with a diameter superior to 0.25 mm) was determined by the immersion in water of an air-dried soil sample, followed by humid fractioning and drying.

To determine the trend of evolution of physical condition, the soil sampling was made:

- at the beginning of the growing period in order to determine the balanced values for the studied physical indexes;
- after all maintenance work, close to the end of the growing season, in order to highlight the trend in the evolution of the studied physical properties, and the residual effects accumulated in time.

3.2. Materials and discussion. Actually, it is widely recognized that within various agricultural technological systems, the movement of agricultural vehicles on the soil surface for different operations of culture maintenance, harvesting and transport has a negative influence on the physical state of the upper level of the profile, especially on the apparent density and porosity.

The most distinctive feature of a soil is its structure, which depends on the pedogenesis and a number of inherent factors: the granulometric component, the content and component of humus, the mineralogical composition of the fine dispersed fractions, the adsorbed cations component.

In a natural regime, the dynamics of the structural-aggregate state is determined by volumetric changes caused by wetting-drying and bulge-contraction which lead to values of apparent density and resistance to penetration.

In an agricultural regime, the structure is determined by the previously mentioned factors and also by a number of anthropogenic factors: the tillage system, the terms and conditions of the works, the fertilizing and culture maintenance system.

Therewith, in an anthropogenic regime, the structural-aggregate state is also influenced by changes in the pedogenetic processes:

- changes in the decomposition and transformations of organic residues processes in the arable regime;
- changes in the humification process due to a development in an air-hydrological regime and also in a redox regime;
- the mineralization of organic substances in an arable regime is accelerated, which causes a deficit of organic substances that participate to aggregation;
- debasification and partial loss of clay. Our research shows that the deficiency of adsorbed calcium in the typical chernozem of Balti's steppe is of about 4-5 me/100 g of soil; because of this, the administration in soil of 2,5 - 3,0 t/ha of carbocalc gives a positive reaction;
- modification of concentration, component and reaction of the soil's solution;
- modification of the organic substances system in the soil. Reduction of the content of labile organic substances. The predominance of cationic form of the organic substances during the vegetation as a consequence of the abnormal hydro-thermal regime (abnormal temperatures, humidity deficit etc);
- severe reduction of fauna (soil mesofauna).

The mentioned factors determine the anthropogenic level of the structuring process. The last one is related to the culture structure and the cropping systems (table 6).

The data of table 6 show that forager-cereal rotation creates the most favourable conditions for structural process realization, but also for structure conservation. In table 6, we can notice that within forager – cereal rotation the content of agronomical valuable aggregates (10 – 0,25 mm) is, approximately, on the level of steppe ecosystem. The same thing is noticed for macro aggregates (> 10 mm) and micro aggregates (<0,25 mm). The specified effects are probably due to the fact that within forager-cereal rotation, mechanical pressures are minimal. In the same time, the forager-cereal rotation ensures a relatively satisfactory quantity of fresh organic material in form of roots debris (these are stored in the whole soil profile). The processes of roots decomposition, in calcium predominance conditions in adsorption complex of soil, ensure annual reproduction of balanced indexes of aggregate structural condition. The data of the aggregate stability are in favor of these statements. In table 6 we can notice that within forager–cereal rotation more than 60 % of aggregates with size > 0,25 mm are hydro-stable.

The highest degree of anthropization of the structuring process is within technical rotations. Within these rotations, the content of aggregates > 10 mm is 1.3

– 1.5 higher than in the case of forager–cereal rotation. The aggregates < 0.25 mm have an analogue behavior. The aggregate stability is decreasing very sharply. In table 6 we can notice that in the 0-50 cm layer of typical chernozem, the aggregate stability is less than 50 %.

Tab. 6 - Structural-aggregate state of typical clayey-loamy chernozems within various cropping systems

Type of cropping system	**Depth, cm**	**Aggregate content, %**			**Content of hydro-stable aggregates, %**		
		>10	10 – 0.25	< 0.25	> 5	5 – 0.25	< 0.25
Forage-cereal	0 – 10	11.3	80.3	8.4	9.7	52.6	37.7
	10 – 20	13.7	77.0	9.3	11.8	56.7	31.5
	20 – 30	14.8	75.5	9.7	10.4	53.0	36.6
	30 – 40	10.7	79.9	9.4	9.3	55.0	35.7
	40 - 50	9.4	82.0	8.6	9.3	61.5	29.7
Cereal	0 – 10	10.1	77.0	11.9	8.3	52.0	39.7
	10 – 20	15.8	71.4	12.8	9.7	47.0	43.3
	20 – 30	19.7	68.5	11.8	10.3	41.9	47.8
	30 – 40	21.4	67.2	11.4	10.1	41.7	48.3
	40 - 50	14.4	72.9	12.7	9.8	49.0	41.2
Technical	0 – 10	13.8	76.0	12.2	7.1	33.3	59.6
	10 – 20	17.7	70.5	11.8	8.8	31.4	59.8
	20 – 30	21.8	66.8	11.4	9.4	36.1	54.5
	30 – 40	27.0	61.8	11.2	9.7	37.8	52.5
	40 - 50	18.0	61.0	11.0	10.3	47.0	52.7
Cereal-improving	0 – 10	12.5	78.5	9.0	9.5	51.1	38.4
	10 – 20	14.7	74.6	10.8	11.4	52.0	36.6
	20 – 30	16.6	70.4	13.0	9.0	49.6	41.4
	30 – 40	15.0	73.6	11.4	9.0	48.3	42.7
	40 - 50	12.0	77.0	11.0	7.0	55.7	37.3

Despite the many statements about the beneficial role of cereal rotations in structuring, we can see in the table that within such rotations the aggregate hydro-stability is just slightly higher than 50 %.The practicing of ameliorative cereal rotations implies the reproductive perspective and structure conservation.

With reference to the processing systems of table 5, we notice that within plowing works, the content of agronomic valuable aggregates in July has critical values. The minimal processing in all cases ensures more attenuated dynamic of structural aggregates index during vegetation. The maximum effects are in the case of 14-16 cm discus –treatment version. Here we notice the most efficient value of aggregate hydro–stability (tab. 7). In the same time, within this system of processing during the vegetation the structural hydro-stability has no changes.

Tab. 7 - Content of valuable agronomic aggregates (10 - 0,25 mm) within various typical clayey-loamy chernozems working systems,%

Working system	May				June				July			
	0 – 10 cm	10 -20 cm	20 – 30 cm	30 – 40 cm	0 – 10 cm	10 -20 cm	20 – 30 cm	30 – 40 cm	0 – 10 cm	10 -20 cm	20 – 30 cm	30 – 40 cm
Ploughed soil	78.4	73.1	71.5	71.3	67.6	68.4	67.3	67.0	61.5	63.7	64.5	61.0
Deep aeration (40 – 50 cm)	79.5	77.6	78.0	79.3	75.3	74.7	74.3	75.6	73.8	73.8	74.6	72.5
Discus treatment– 18 cm	79.3	78.5	78.0	77.1	76.8	75.9	74.9	75.0	73.9	75.0	74.8	74.3
Discus treatment- (14 – 16 cm)	80.7	81.3	79.9	78.7	79.1	79.7	78.0	78.3	76.2	76.8	76.8	78.4

Tab. 8 - Content of hydro-stable aggregates within various typical clayey-loamy chernozems working systems,%

Working system	May				June				July			
	0 – 10 cm	10 -20 cm	20 – 30 cm	30 – 40 cm	0 – 10 cm	10 -20 cm	20 – 30 cm	30 – 40 cm	0 – 10 cm	10 -20 cm	20 – 30 cm	30 – 40 cm
Ploughed	61	58	58	57	53	51	51	49	48	46	49	52
Deep aeration (40 – 50 cm)	63	65	65	61	64	62	60	62	62	59	59	54
Discus treatment– 18 cm	67	67	65	64	68	70	65	66	67	61	63	66
Discus treatment- (14 – 16 cm)	70	72	72	68	72	74	73	73	69	71	70	73

The mentioned features throw on the dynamics of apparent density and pore space of soil. Our research has shown that the dynamics of the apparent density in an agricultural regime is classified in 4 intervals (Jigău, 2007):

- the minimal apparent density is installed in soils after the basic works and reaches no more than 1g/cm^3 (September - October). Close to the cold period, the values rise, reaching 1.20 g/cm^3 (1.22-1.28 g/cm^3);

- a balanced apparent density (1.05-1.20 g/cm^3) is installed at the end of the cold period - the beginning of the growing period;

- the optimal density (1-13-1,30 g/cm^3) is maintained until the end of May - the first decade of June;

- the critical density (>1.35 g/cm^3) is installed in the soil starting from the second decade of June until the end of growing period (September), when the apparent density can reach 1.45-1.50 g/cm^3.

Such values are often reached in agricultural soils, decompaction is progressing slowly and in droughty years this process is not entirely finalized, leading to accumulation of residual compaction. As a consequence, between 53% and 87% of agricultural soils are affected by compaction. Thereby, within the soil profile, the ploughed layer is visibly stratified, starting with the position, the alternation of aerated and compact layers, the accumulation and accessibility of nutrients that limit the absorption of water and the development of roots.

In a natural regime, the most important factors which determine the macro- and microporous volume, the size and distribution, stability and continuity of pores are the granulometric component and humidity (Jigău, 2007).

In an agricultural regime, the space pore evolution is determined by the dynamics of the soil apparent density. Our research based on the generalization of approximately 1500 measurements has shown that soils with a middle fine granulometric component (clayey-loamy and loamy-clayey) present a significant volume decreasing from 57% to 41% in the apparent density interval from 1.22 until 1.62 g/cm^3.

Tab. 9 - The compaction impact on pore space and soil hydro-physical characteristics

Apparent density g/ cm ^{3}	Total porosity %	Differential porosity % v/v					Hydro-physical indexes % v/v		
		□ 0.2 μ	0.2 – 1 μ	1 – 10 μ	10 – 300 μ	□ 300μ	CO	CC	CAU
1.00 – 1.25	54.7	7.3	8.8	24.0	7.9	6.7	10.3	28.8	18.5
1.26 – 1.40	48.5	10.8	9.2	19.6	5.9	2.8	11.4	27.6	15.2
1.41 – 1.45	46.7	11.3	9.4	20.0	4.3	1.7	12.0	26.9	14.9
1.46 – 1.50	43.7	13.2	10.4	18.2	1.9	0	12.6	26.3	13.7
1.51 – 1.55	42.0	16.9	10.5	12.9	1.7	0	13.3	26.1	12.8
1.56 – 1.60	39.7	16.9	10.3	11.2	1.3	0	14.8	25.5	10.7

Therewith, an increasing volume is observed for pores smaller than 0,2μ (tab. 7). Calculation based on the suction curve shows that their volume within the apparent density critical interval (smaller than 1.45 g/cm^3) composes 7.3-11.3%. The subsequent increase of the apparent density until 1.55-1.60 g/cm^3 leads to the volume increase for pores smaller than 0.2μ to 16.9%.

Similar laws are observed for soils with a fine granulometric component: in the apparent density interval between 1.25-1.69 g/cm^3, the volume of pores smaller than 0.2μ increases from 11% to 19%.

Tab. 10 - The differential porosity of typical moderated humiferrous, clayey-loamy chernozems, depending on the tillage system, at the end of growing period

Parameter	Depth, cm	Working system			
		Plough-ing	**Deep aeration with paraplow (40 – 50 cm)**	**Discus treatment (18 cm)**	**Discus treatment (14 – 16 cm)**
Total porosity %	0 – 10	52.4	57.5	55.4	55.2
	10 – 20	49.6	53.8	52.6	52.7
	20 – 30	48.3	50.1	50.3	50.1
	30 – 40	46.7	48.6	49.4	48.9
Coarsely-aggregate porosity %	0 – 10	32.3	36.8	35.7	35.9
	10 – 20	30.8	38.4	38.9	39.4
	20 – 30	29.1	36.7	35.5	36.3
	30 – 40	28.3	32.8	33.6	32.9
Inter-aggregate porosity %	0 – 10	20.1	20.7	19.7	19.3
	10 – 20	18.8	15.4	13.7	13.9
	20 – 30	19.2	13.4	14.4	13.8
	30 – 40	18.4	15.8	15.8	16.0
Humidity conducting pores %	0 – 10	20.1	21.4	20.7	20.4
	10 – 20	19.3	23.4	22.4	22.9
	20 – 30	18.7	21.7	20.4	20.8
	30 – 40	18.4	18.3	14.3	18.6
Humidity protecting pores %	0 – 10	12.2	15.4	15.0	15.5
	10 – 20	11.1	15.0	16.5	16.5
	20 – 30	10.9	15.0	15.3	16.0
	30 – 40	9.9	14.5	15.3	14.3

Taking into consideration the information of table 9, we can draw the conclusion that in the process of soil compaction, the volume of humidity conductors pores in which plants' roots penetrate is decreasing and the volume of fine pores in which the plants' roots do not penetrate is increasing, and water is kept inside them with forces greater than 16 atm., being useless for plants.

The same research shown that the most unfavorable porosity regime in soils can be found between the values of 1.47 - 1.50 g/ cm³ of apparent density.

The changes inside the pore space lead to a decreased degree of mobility and water accessibility. It was established that in the range of 1.40 – 1.52 g/ cm³ of apparent density, the values of fading coefficient increase with 29 – 30 %, compared to the range of 1.22 – 1.39 g/ cm³.

The field capacity for water is reduced with approximately 4%, due to the compaction process. In the same time, the increased value of fading coefficient leads to the reduction of 8% of useful water capacity. Another consequence, in the ploughing layer, is the significantly increase of transmission pores volume, which favors the physical evaporation and the accelerated water intake from soil.

The specified changes determine the harassment of seasonal and multiannual cycles of basic processes and of substances' account and regime in pedogenesis, these getting a pronounced anthropogenic character, involving new migration and accumulation of substances forms and processes, which determine the diminishing of several soil characteristics.

Within the intensive (industrial) agricultural systems, the consequences of the mentioned processes are more frequently noticed. On the contrary, in case of alternative (conservative) agricultural systems, the dynamics of pore space is attenuated (tab. 10).

The data of table 10 show that conservative working systems assure a ploughing layer with a more uniform pore space, with porosity values situated in ranges of optimal or relatively optimal values. At once, within the alternative working systems, there is an optimal ratio between the humidity protecting and conducting pores, hence assuring a normal functionality of the soil ecosystem and almost eliminating the risk of soil physical degradation. Additionally, conditions are created for optimizing the ratio between the processes of mineralization and humification of organic residues, in favor of the last ones.

In case of agricultural technologies, based on ploughing, a scarceness porosity regime is created, which affects the sense and the intensity of elementary pedogenetic processes centered on the reproduction of the chernozems type of pedogenesis.

Conclusions

In agricultural regime of the soil react primarily the structure and apparent density. They cause the soil porosity, therefore pore space is a comprising index of physical change processes showing certain dependencies on the impact upon soil.

In case of conventional agricultural soil working systems, based on ploughing, the physical degradation processes (compaction. dismantling) have major ratios and lead to the constitution of a faulty pore space in soil, which affects the processes of reproducing the chernozems type of pedogenesis.

The alternative (conservative) tillage systems diminish the stratification, reduce soil profile stratification and ensure the stability as well as the continuity of pore space. During the whole year, the optimal conditions are created for ecosystem functioning and reproduction of soil type chernozem soil formation.

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