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**ЛАНДШАФТНЫЙ ПОДХОД В ИЗУЧЕНИИ АЛЛЮВИАЛЬНЫХ ПОЧВ
РЕСПУБЛИКИ МОЛДОВА****LANDSCAPE APPROACH IN THE STUDY OF ALLUVIAL SOILS
OF THE REPUBLIC MOLDOVA****Лях Т.Г.**

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Аннотация. Дана характеристика аллювиальных почв Нижнего Днестра Молдовы. Данные почвы отличаются высокой биогенностью, слоистостью, наличием погребённых гумусовых горизонтов. В зависимости от процесса почвообразования подразделяются на следующие подтипы: слабо развитые, типичные, полуболотные и болотные. Для разработки рекомендаций по сельскохозяйственному использованию и улучшению свойств аллювиальных почв на региональном уровне, необходимы сведения о границах распространения свойств почв, почвообразующих пород и грунтовых вод, основанных на системно-ландшафтном подходе.

Abstract. The characteristic of alluvial soils of Lower Dniester River of Moldova is presented. These soils are characterized by high biogenicity, layering, and the presence of buried humus horizons. Depending on the process of soil formation, they are divided into the following units: weakly developed, typical, semi-swamp and swamp. The recommendations for agricultural use and improvement of alluvial soils properties, at the regional level, information on the limits of the distribution of soil properties, soil-forming species and groundwater, based on the system-landscape approach, is necessary.

Ключевые слова: аллювиальные почвы, классификация почв, морфометрические показатели, глеевый горизонт.

Keywords: alluvial soils, soil classification, morphometric indices, gleyic horizon.

The spatial environment within the main landscape components have formed and exist without human intervention is a natural landscape. Therefore, the landscape approach in the study and forecasting of territorial development in order to optimize nature management is becoming increasingly important. Anthropogenic impact on the natural landscapes is constantly growing, which leads to negative changes in the environment [8].

In conditions of the soil cover degradation and climate global warming, the food security of Moldova can only be ensured by expanding the areas of irrigated soils. The most suitable areas for the development of irrigated agriculture are the lands in the river meadows with alluvial soils (alluvials). On the territory of Moldova, within the agricultural lands, the alluvial soils occupy the surface of about 117 thousand ha and are the main object for the development of irrigated agriculture, as they can be easily provided with water through irrigation [2, 9]. In this case, a major interest for the expansion of irrigated agriculture is the alluvial soils of the Lower Dniester meadow.

The concept of alluvials (alluvial soils) includes soils formed from alluvial material or on the alluvial deposits that receive or have recently or in the past received fresh material at regular intervals, a fact reflected by the stratification or irregular decrease with depth of the organic carbon content, or which remains at over 0.20% up to a depth of 125 cm; alluvial material must be present starting from the first 25 cm from the surface [4, 7].

Alluvial soils are mainly defined by a weakly or moderately evolved Am horizon with a thickness greater than 20 cm, followed by parental material consisting of alluvial, alluvial-lacustrine or recent lacustrine deposits, of any texture. These soils are formed under conditions of more or less regular overflows of running water. In the intervals between overflows, the manifestation of solification (soil formation process) is possible, the intensity of which is all the greater, the longer the time that has passed since the last overflow. In meadows or meadow parts of river, out of the influence of overflows or flooded only at large time intervals, solification advances, leading to the transformation of fluvial soils (fluvisols), which are poorly or moderately evolved soils, into evolved alluvial soils (humic or deep humic), [6].

Alluvial soils, as a result of extremely different conditions regarding the duration of solification manifestation, the climate of the area, the origin of the alluvial deposits, their texture and composition, the depth and mineralization of the groundwater, are characterized by a very large variation in properties and structural composition. Depending on the type of profile and the features of the horizons, the following upper-level alluvials units are separated: *poorly developed, typical, semi-hydric, hydric* [3].

Poorly developed alluvials have a profile of the following type: AC - IC - 2C - 3Cg. They are spread in the meadows of the Prut and Dniester rivers on young, recent or current relief units (minor beds), which carry out intense actions of transporting and depositing the material. Weakly evolved alluvials, formed on homogeneous deposits have a uniform texture, and those formed on inhomogeneous parent material have a contrasting texture. As a rule, these soils are unstructured. The accumulation of organic matter in these soils

is poorly expressed. It is characterized by a small content of humus, around 1-2%, coming from the respective deposits or formed due to the organic matter resulting from the weak vegetation spread on these soils [3, 5].

*Typical alluvisol*s form on non-flooded meadows or on the slopes of flooded meadows at longer time intervals. In such situations, the development of vegetation, the manifestation of solification in the formation of a moderately evolved humiferous horizon was possible. They have the following profile: *Ah - 1AC - 2AC - 1Cg - 2Cg*. The thickness of the humiferous profile is 40-50 cm and more. The texture of the profile, depending on the homogeneity of the alluvial deposits, can be uniform or contrasting. Typical alluvisol s have a poorly to moderately developed glomerular, granular or polyhedral structure. Compared to poorly developed alluvial soils, they have a higher humus content - 2-3%.

*Hydric alluvisol*s are spread in abandoned riverbeds or at the tail of ponds, they were formed from alluvial deposits in the presence of groundwater at a depth of 0-30 cm from the surface for a long time. They have the type profile: *Ahg - Gr* or *ACg - Gr*.

*Semi-hydric alluvisol*s are widespread in riverbeds and were formed due to recent alluvial deposits in the presence of groundwater at a depth of 50-70 cm from the surface for a long time. They have the type profile: *Ahg - 1ACg - 2ACr - Gr* or *ACg - ACr - Gr*. The humic profile is weakly or moderately developed, and the gleization is strongly expressed. The humus content is 1-3%.

Alluvisol s are characterized by a very large variation in physical, chemical and geochemical properties. Irrigation acts differently on the quality status of alluvial soil varieties and production capacity [1]. The alluvisol s post drained swamps and irrigated for about 30 years (the study object) is widespread in the meadow below the terraces of the Lower Dniester on the territory of the Căușeni and Ștefan Vodă districts. Currently, the irrigation of the post-swamp's alluvial soils in the territory of the Copanca commune is carried out by sprinkling with a Fregat-type irrigation installation. The soils are used to grow the vegetables - dill, carrot, onion, etc. (Fig. 1, 2).

Until the development works for irrigation were carried out, the surveyed land was swamped and often affected by the overflows of the Dniester River. In 1985, a dike was built, which completely avoided overflows on this land and an efficient drainage-drying system of the soils of the Lower Dniester meadow on the territory of the commune. Currently, this drainage system ensures the permanent level of groundwater deeper than 2 m from the land surface.

In the basis of landscape methods lies the comparative-geographical approach, the condition of which is the obligatory presence of a topographic map characterizing the relief - the main factor in the differentiation of the soil cover. Therefore, one of the simplest and at the same time effective research methods is the geomorphological soil profile bookmarking method [5].



Fig. 1 - Installation used for the irrigation of dried alluvial soils



Fig. 2 - The use of soils in the Lower Dniester meadow

The profile of alluvial soils (Fig. 3). The composition of the studied irrigated alluvial soils profile is characterized by the following type: *Ahp1* (0-20 cm) → *Ahp2* (20-38 cm) → *ABh* (38-57 cm) → *Bhg* (57-80 cm) → *Abhg* (80- 95 cm) → *Bbhgk* (95-115 cm) → *Gk1* (115-135 cm) → *G2* (135-160 cm) → *G3* (160-200 cm).

Morphometric indices include data on the thickness of genetic horizons of irrigated alluvisol s. The average statistical parameters of the morphometric indices of the investigated soils are presented in Table. The accuracy of the assessment of the average parameters of these indices is within 0.6-1.5%. The coefficient of variation values is within 2.9-9.5%.

In relation to the profile provenance of these soils through the sedimentation of alluvial deposits, the

stratified composition of their profile in space and in depth is very variable. The profile of the investigated soils is less differentiated in genetic horizons in the upper part and is characterized by buried soils and gleyic horizons in the lower part. This is due to the fact that in the part below the terrace of the meadow, overflows rarely occurred, and after the construction of the dikes, they were stopped.

Differentiation into more or less regular genetic horizons is observed only up to a depth of 80 cm. In the 80-95 cm depth interval, there is an Abhg humiferous horizon, formed in another historical period. Below this horizon is an extremely pronounced gleyic horizon with thin humiferous layers. So, the investigated soil profile is made up of the buried post-swamp gleyic soil, very wet, located at a depth of 80-200 cm and the contemporary soil, with a developed humiferous profile, weakly glazed in the lower part, located in the depth range of 0-80 cm.

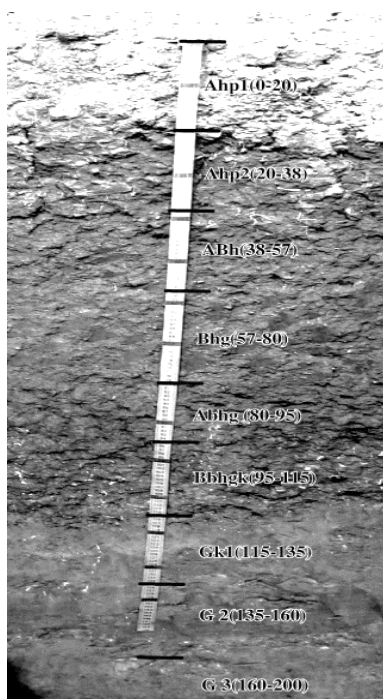


Fig. 3. Irrigated alluvial profile



Fig. 4. The natural structure of the alluvial soils

Physical indices. The density of the investigated soils profile varies from 2.65 ± 0.14 in the arable horizon to 2.75 ± 0.13 in the Bbhgk horizon. The accuracy of determining the average indices varies within the limits of 1.86-3.03%, the coefficient of variation of the density in space does not exceed 6.1%. The apparent density in the profile of irrigated alluvisolts varies from 1.23 ± 0.14 g/cm³ in the arable layer, to 1.44 ± 0.08 g/cm³ in the underlying layers. The arable layer is characterized by optimal apparent density values, but the underlying arable layer is very compacted (Fig. 4).

Table. Statistical parameters of morphometric indices on alluvial soils genetic horizons

Genetic horizon and depth, cm		<i>X</i>	<i>s</i>	<i>V</i> , %	<i>m</i>	<i>P</i> , %	<i>n</i>
The thickness of genetic horizons, cm							
Ahp1	0-20	20	0,6	2,9	0,3	1,4	4
Ahp2	20-38	18	0,8	4,5	0,4	2,3	4
ABh	38-58	21	1,4	6,7	0,7	3,4	4
Bhg	58-79	21	1,5	7,3	0,8	3,6	4
Abhg	79-95	16	1,2	7,2	0,6	3,6	4
Bbhgk	95-111	16	1,5	9,5	0,8	4,8	4

The development of recommendations for agricultural use and improvement of alluvial soils, at the regional level, information on the limits of the distribution of soil properties, soil-forming species and ground-water, based on the system-landscape approach, is necessary. Alluvial floodplain soils should be used only under those crops that need high moisture and do not require zonal soils with a developed profile. These are primarily forage grasses and vegetable crops.

Conclusions. The irrigated alluviosols of the Lower Dniester meadow are characterized by the following properties:

- stratified profile with gleyic clayey marshy soil buried (fossil) at a depth of about 80 cm;
- the contemporary soil with a thickness of 80 cm is characterized by a homogeneous texture and a developed humiferous profile, differentiated in genetic horizons;
- the texture is clayey on the contemporary soil profile (up to a depth of approximative 80 cm) and fine clayey on the buried soil profile;
- good structure of the arable layer, as a result of soil work, freezing and thawing in the winter period;
- the underlying post-arable layer is characterized by an unsatisfactory massive structure, as a result of dehumification, destructuring and loss of resistance to compaction;
- the low content of carbonates on the profile and the slightly alkaline reaction ensures the normal development of cultivated plants;
- submoderate humiferous profile of the contemporary and buried soil;
- the state of physical quality of the investigated soils can be assessed as average for the recently arable layer and unsatisfactory for the post-arable layer.

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References

1. Calășnic A. (2008). Analiza inundațiilor în Republica Moldova, râurile Nistru și Prut. Informație analitică privind problema inundațiilor în Republica Moldova. Ch., Institutului Acvaproiect. - 10 p.
2. Cerbari V., Stegăreacu Gh. (2016). Quality assessment of irrigated fluvisol. Scientific paper. Series A. Agronomy, Vol. LIX, 2016. - p.33-38.
3. Cerbari, V. (2001). The system of classification and reclamation of soils of the Republic of Moldova for the elaboration of pedological studies. Chisinau: Pontos. - 103 p.
4. Didenco, V. (2022). Peculiarities of alluvial soils formation from the lower Botna river meadow. Scientific Papers. Series Agronomy. Vol. LXV (2). - p. 48-53
5. Florea, et. al. (1987). Methodology for the development of pedological studies. Part III. Ecopedological indicators. Bucharest. - 226 p.
6. Leah, T. (2018). Solurile aluviale înțelenite din lunca Nistrului de Jos: situația ecologică și managementul durabil. Lucrări științifice, Vol. 52(1). Agronomie și Agroecologie. Mater. Simpoz. Științific Internațional "85 ani ai Facultății de Agronomie – realizări și perspective". UASM (Chisinau, 4-6 octombrie, 2018). - p. 398-403.
7. Leah, T.; Cerbari, V. (2019). Caracteristica solurilor aluviale hidromorfe din lunca Nistrului. Hydropower impact on river ecosystem functioning. Proceedings of the International conference (Tiraspol, Moldova, Oct. 8-9, 2019). - p. 221-224.
8. Методы изучения структуры почвенного покрова - ландшафтный подход. 19.03.2023.
9. https://ozlib.com/1024264/agro/metody_izucheniya_struktury_pochvennogo_pokrova#28647
10. Programul complex de valorificare a terenurilor degradate și sporirea fertilității solurilor. (2014). Partea I. Ch.: Pontos. - 212 p.