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ERODED SOILS DATABASE

Andrei Ursu, A. Overcenco, P. Vladimir, I. Marcov,
Stela Curcubăt, Vera Krupenicov
Institute of Ecology and Geography, Moldovian Academy of Sciences

Abstract: In the Laboratory of Geography and evolution of the soil of the Institute of Ecology and Geography of an Academy of sciences of Moldova the Database of eroded soil is created. The base includes the dates on the characteristic of a morphological structure of a profile and physical-chemical proprieties of soils.

Key words: *soil erosion, database*

Introduction

The Republic of Moldova soil envelope is non-homogenous and displays various genetic and taxonomic types, subtypes and genres. Because of the steep topography, torrential character of the summer rains, overuse of the land, the dominance of the cultivated crops and the lack of soil protection measures, on the slopes are activated erosional processess. The surface of the eroded soils surpassed 1million ha and keeps growing [1].

Objectives and research methods

The objectives and the research methods were directed to obtain exhaustive data regarding eroded zonal soils: brown, grey and chernozems. In the field were opened soil profiles and was studied their morphological structure. Soil profiles were phorographed with a digital camera. Were sampled each genetic horizon.

A special attention was on zonal soil research which undergo different stages of erosion. These soils were studied in cultivated and characteristic areas. For the soils samples were determined: hygroscopicity, humis content, carbonates, exchange cations and pH.

Results and discussions

The studies demonstrated that the eroded soils are quite different from the original ones, both morphologically (theay are beheaded) and their structure, properties and productivity. The differences are conditioned by their genetical type and subtype, their erosional status, soil texture, etc. A general property of the soil envelope of any taxonomic unit cannot be appropriate without an objective evaluation of the erosion status. This informatin is strictly necessary for GSI creation and for antierosional zonal complexes [2].

The Laboratory of geography and soil evolution within the Institute gathered the needed information, the data published in various reviews and created a soil eroded database. This database includes textural characteristics of the eroded soils, their location dynamics, their structure, photos of the soil profiles, etc.

In the tables and the photos below are presented the structure of the zonal soils – brown, grey and chernozems with different degrees of erosion.

The morphological characteristics of the eroded brown soils

Weak eroded brown soil. Profile 87, located in the upper hillslope, in Vorniceni village, Străşeni:

A 0-20 cm, dry, brown, yellowish in the depth, smooth transition, clayey, compacted, small glomerular structure;

B_1 20–40 cm, brown, dry, smooth transition, clayey, small glomerular structure;

B_2 40–60 cm, brown, dry, smooth transition, clayey, glomerular structure;

BC 65–80 cm, moisty, unhomogenous color, with brown shades, smooth transition clayey-sandy, weak compaction

C 80–100 cm, moisty, unhomogenous color, stratified, clear transition, clayey-sandy, weak compaction.

Moderate eroded brown soil. Profile 86, same location, slope 4-6°:

B_1 0–20 cm, dry, brown, smooth transition, clayey granulometry, compacted, small glomerular structure;

B_2 (20–50 cm), dry, brown-yellowish, smooth transition, clayey granulometry, lumpy structure;

BC (50–75 cm), dry, brown-yellowish,
smooth transition, clayey;

C (75-100 cm), yellowish clay-sandy.

Strong eroded brown soil. Profile 85, same location:

B 0–30 cm, dry, brown-yellowish, smooth transition, clayey, compacted, granulate structure, unstable;

BC 30–55 cm, moist, yellowish with brown shades, smooth transition, clayey-sandy, weak compaction;

C_1 55–80 cm, moist, ungomohenous, yallowish, stratified, clear transition, clay-sandy, very weak compaction;

C_2 80–100 cm, moist, grayey-white, spotted, ($CaCO_3$).

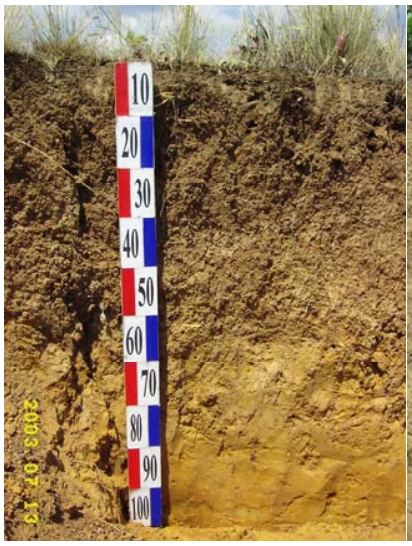

Photo 1. *Weak eroded brown soil*

Photo 2. *Moderate eroded brown soil*

Photo 3. *Strong eroded brown soil*

Table 1. *Physical-chemical properties of the eroded brown soils*

Depth, cm	Hygroscopicity	Humus	$CaCO_3$	Exchange cations			pH
				Ca^{++}	Mg^{++}	∑	
	%			mg e/100gsol			
Profile 87, Weak eroded brown soil							
1	2	3	4-	5	6	7	8
0-10	2,87	1,81		15,63	4,53	20,16	5,36
25–35	3,02	0,71	-	13,60	5,36	18,96	5,19
50–60	2,19	0,40	-	9,81	4,10	13,90	5,05
70–80	1,34	0,19	-	6,08	3,65	9,73	5,15
90–100	0,80		-	4,23	2,62	6,85	5,8
Profile 86, Moderate eroded brown soil							
0–10	3,18	0,34	-	15,27	4,13	19,4	6,2
20–30	3,37	0,29	-	15,30	4,96	20,26	6,0
40–50	3,06	0,23	-	14,63	4,75	19,38	6,1
70–80	4,00	0,19	-	17,47	5,41	22,88	6,0
90–100	3,12		-	15,26	4,54	19,8	5,9
1	2	3	4	5	6	7	8
Profile 85, Strong eroded brown soil							
0–10	2,54	1,28	-	13,95	3,69	17,64	6,8
20–30	3,48	0,48	-	16,97	4,14	21,11	6,4
40–50	3,00	0,43	-	14,42	4,53	18,95	6,2
60–70	3,15	0,24	-	14,85	4,95	19,80	5,95
90–100	4,10		-	20,4	5,83	26,23	7,2

The erosion of the brown soils shrinks the depth of the A horizon, then B horizon. Linked with the erosional intensity at the soil surface are evidenced

different B subhorizons which their composition detemines their properties. Because in brown soils B horizon has clear illuvial properties, the plow horizon still has some humus and can be worked easily and does not display negative physical properties.

Eroded brown and grey soil are located only in the central part of the Codri area in the pedogeographic region no.7: The region of the forest brown and grey soil of the Codrilor Tableland.

Morphological characteristics of grey eroded soils, located on a south hillslope in Căbâieşti village, Călăraşi county

Weak eroded grey soil. Profile no. 91c:

A, 0-28 cm, dry, dark grey, clear transition, silty clayey, compacted, small granulated structure;

B_1, 28–50 cm, moisty, brown, smooth transition, silty clayey, compacted, small granulated structure;

B_2, 50–65 cm, moisty, brown-reddish, smooth transition, silty clayey, compacted, small granulated structure;

BC, moisty, brown yellowish, when dry is whitesh, smooth transition, silty clayey, large granulates structure an weak nutlike forms;

C, 65-100 cm, light grey, weak structure.

Moderate eroded grey soil. Profile 91b

B_1, 0–10 cm, moisty, brown, smooth transition, silty clayey, small granular structure;

B_2, 10–50 cm, moisty, brown-reddish, smooth transition, silty clayey, compacted, small granular structure;

BC, 50-70 cm, moisty, brown yellowish, whiteish when dry, smooth transition, silty clayey, compacted, large granular structure and weak nutlike forms;

C, 70-100 cm, light grey, weak structured.

Strong eroded grey soil. Profile 91 a:

B_2, 0–28 cm, moisty, brown-reddish, smooth transition, silty clayey, compacted, small granular structure;

BC, 28-45 cm, in moisty state is brown-yellowish, dry state – whiteish, smooth transition, silty clayey, compacted, large granular structure and weak nutlike forms;

C, 45- 100 cm, light grey, weak structured.

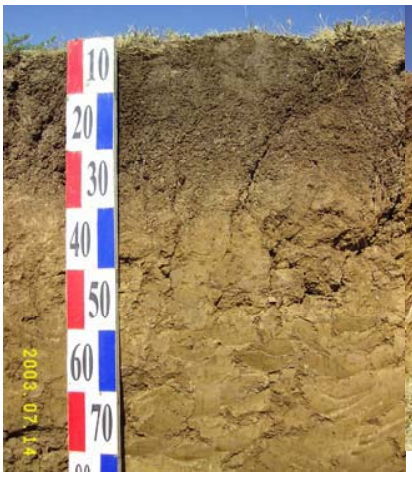

Photo 4. *Weak eroded grey soil*

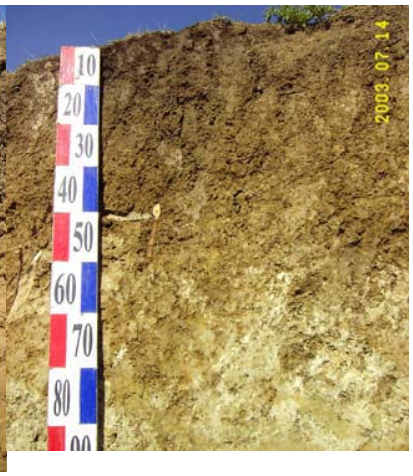

Photo 5. *Moderate eroded grey soil*

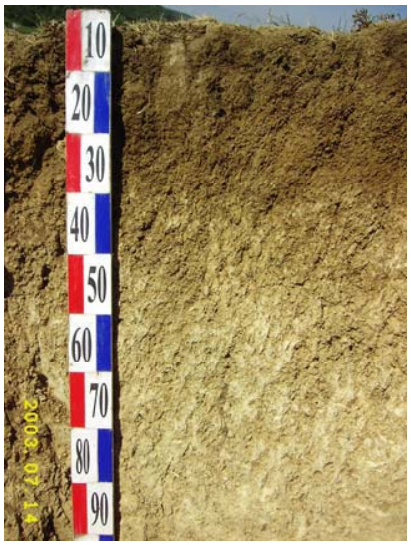

Photo 6. *Strong eroded grey soil*

Table 2. *Physical-chemical properties of the eroded grey soils*

Depth, cm	Hygroscopicity	Humus	$CaCO_3$	Exchange cations			pH
				Ca^{++}	Mg^{++}	∑	
	%			mg e/100gsol			
Profile 91c, Weak eroded grey soil							
0–10	3,59	4,03	-	19,06	4,97	24,03	7,15
30–40	4,04	1,01	-	12,90	7,91	20,81	6,30
60–70	4,88	0,62	-	15,94	9,23	25,17	6,1
90-100	3,04	0,41	-	13,19	7,42	20,61	7,9
Profile 91b, Moderate eroded grey soil							
0–10	3,39	3,21	-	36,39	10,76	47,15	7,5
30–40	4,03	0,83	-	17,48	5,41	22,89	6,95
60-70	2,82	0,56	-	16,04	4,52	20,56	8,0
90–100	2,82	0,35	-	15,22	4,52	19,74	8,1
Profile 91a, Strong eroded grey soil							
0–10	3,84	1,15	-	20,14	5,20	25,34	7,50
30–40	3,39	0,62	-	19,02	4,14	23,16	7,90
60–70	3,60	0,39	-	19,68	4,36	24,04	8,05
90–100	3,51	0,30		19,46	4,55	24,01	8,20

The main difference among the studied profiles is the presence of the genetic horizons and the thickness of the fertile horizons and of each horizon.

Eroded grey soils are different in respect with their properties and connected with the intensity of erosion. Starting with the moderate stage, B

horizon lies as the topsoil and has an illuvial character. The plowing horizon becomes more silty, physical properties become less favourable: lower permeability, the technical works become more difficult to be made. The reduced humus content and the lack of hidrostable structure worsen the properties of eroded grey soils.

Morphological characteristics of eroded chernozems, located on a west hillslope in Cicur Mingir village, Cimişlia county

Weak eroded typical chernozem. Profile no.76:

A 0-20 cm, dry, dark grey, smooth transition, clayey, weak compaction, small granular structure;

B_1 20–40 cm, dry, brown-grey, smooth transition, weak compaction, weak granular structure, effervescence from 45 cm;

B_2 40–60 cm, dry, yellowish-whiteish, smooth transition, clayey, weak compaction, no perceptible structure;

C 60–100 cm, moisty, yellowish with sport of carbonates, weak compactoin, crotovinas.

Moderate eroded typical chernozem. Profile no. 75:

B_1 0–20 cm, dry, greyish-brown, smooth transition, clayey, weak compaction, glomerular-grainy structure;

B_2 20–42 cm, dry, yellowish-whiteish, smooth transition, clayey, weak compaction, weak structure;

BC 42–60 cm, dry, yellowish-whiteish, lighter than upper horizon, white spots, weak compaction, no structure;

C 60-100 cm, dry, yellowish with carbonates spots, weak compaction, crotovinas.

Strong eroded carbonatic chernozem. Profile no. 77:

B 0-20 cm, dry, brown-yellowish, smooth transition, clayey, weak compaction, weak small glomerular structure;

C_1 20–60 cm, dry, whiteish-yellowish, clayey, no structure;

C_2 60–100 cm, moist, whiteish, clayey, no structure, crotovinas.

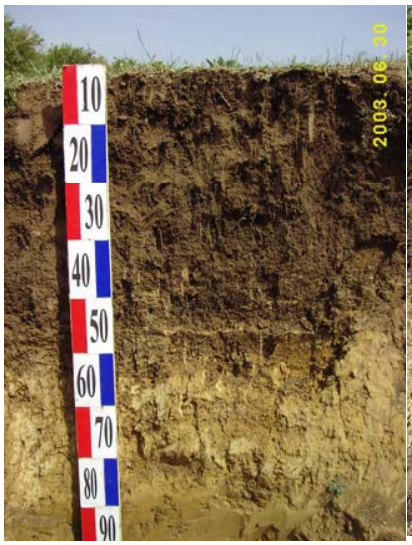

Photo 7. *Weak eroded tipical chernozem*

Photo 8. *Moderate eroded chernozem*

Photo 9. *Strong eroded chernozem*

Table 3. *Physical-chemical properties of the eroded chernozems*

Depth, cm	Hygroscopicity	Humus	$CaCO_3$	Exchange cations			pH
				Ca^{++}	Mg^{++}	∑	
	%			mg e/100gsol			
Profile 76, Weak eroded typical chernozem							
0–10	3,58	2,7	–	22,79	7,87	30,66	7,5
25–35	3,71	2,1	-	19,08	10,79	29,87	7,9
45–55	4,08	1,3	2,44	18,94	11,45	30,39	8,5
70–80	2,87	0,5	5,83	10,70	13,17	23,87	8,9
90–100	1,57		1,39	6,09	7,72	13,81	8,7
Profile 75, Moderate eroded typical chernozem							
0–10	3,39	2,7	-	22,13	7,65	29,78	7,65
25-35	329	1,7	-	19,42	7,85	27,27	7,60
45–55	2,29	1,20	6,96	16-48	8,86	25,34	8,30
70–80	1,43	0,5	9,65	8,11	8,52	16,63	8,70
90–100	1,58	-	4,36	6,30	8,73	15,03	8,60
Profile 77, Strong eroded carbonatic chernozem							
0–10	3,49	1,7	0,6	30,2	11,2	41,4	7,80
30–40	2,12	0,6	5,30	14,44	6,94	18,38	8,20
70–80	2,03	0,4	4,25	8,98	8,98	17,96	8,43
90–100	2,23	2,3	8,04	8,18	10,63	18,81	8,55

For the eroded chernozems as the intensity of erosion grows, the humus horizon decreases and the carbonates horizon comes closer to surface. For the profile 77, the soil is carbonatic from the surface. The presence to the surface of the transition B horizon, which is less humified and structured leads to a

decrease of the productivity of the eroded chernozems and worsen the physical properties of the plowing horizon.

Conclusions

The database of the morphological and physical-chemical properties of the eroded soils is created for electronic record of all the data stored in the Laboratory of geography and soil evolution within Ecology and Geography Institute of the Moldova Academy Sciences, also data gathered from specialised scientific reviews. Genetic and taxonomic units influence and conditionates the morphological peculiarities, properties and arable pretability of the eroded soils. There is a strong dependency between soil genetic type and erodability and productivity of the eroded soils. These peculiarities must be considered when projects are made and for the implementation of the zonal antierosional complexes. The database can be used as a factual material in order to solve various scientific and practical issues.

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