EROSION PHENOMENA IN THE BISTRA HYDROGRAPHIC BASIN

FENOMENE EROZIONALE ÎN BAZINUL HIDROGRAFIC BISTRA

NICOLETA NEMEŞ[1], IOANA ALINA COSTESCU [2]

[1,2]National Institute of Land Reclamation Research and Development "ISPIF" Bucharest – Banat Branch Office

Corresponding author: Nicoleta Nemeş, e-mail:nemesnicoletac@yahoo.com

Abstract: *The exact appreciation of the soils degradation state, by the erosion and associated processes, is an operation that involves high costs and a long time for observations, determinations and measurements. It also requires a geographic informational system that allows to identify the spatial dates and to compare these dates and the interpretation of theses are made through analytical methods. In Romania, the intensity of the soil erosion on the agricultural lands is very high; annual 106 mil to/year of soil are lost. In Bistra Hydrographic area the surface erosion is caused by the improper usages of the lands and by the excessive grazing.*

Rezumat: *Evaluarea corectă a stării de degradare a solurilor prin eroziune şi procese asociate este o operaţiune laborioasă care implică costuri ridicate, precum şi o perioadă îndelungată de observaţii, determinări şi măsurători, utilizarea unui sistem informaţional geografic care permite identificarea rapidă a datelor spaţiale şi descriptive asociate, iar interpretarea rezultatelor se face prin metode analitice. În România intensitatea eroziunii solului pe terenurile agricole este alarmantă, anual pierzându-se prin eroziune 106 mil t/an. În bazinul hidrografic Bistra eroziunea de suprafaţă este determinată de utilizarea incorectă a terenurilor în pantă şi de păşunatul excesiv.*

Key words: *erosion, degradation, land slope.*
Cuvinte cheie: *eroziune, degradare, pantă.*

INTODUCTION

Soil erosion is a natural process and has occurred throughout geological history. Human activities, particularly agriculture and deforestation, however, have increased erosion rates, as they tend to remove the protective vegetation and reduce the stability of the soils.

Generally, all the natural and entropic factors that determinate the soil's degradation and the erosion processing appearance are in the soil profile. Interdependence between the soil's characteristics and the lands usage exist. A part of the agricultural lands that are situated in slope, where the erosion process get up the parental rocs, are already draw out from the agricultural usages or are in a improperly state of quality. In either case, identification measures, to identify the lands where the erosion factors action with a different velocity, according with the soil's type and land's usage, are needs.

However the hazards that are determinate by the erosion processes are quote frequently (RĂDOANE, 2004), though the areas where the speciality studies exist are reduced.

The pedoclimatic condition of the west part of Romania, especially the areas that have agricultural usages (conditions that determinate to border the area from the high plane and from the low hill into the half-dry moderate warming climatic area, and the area of the high hill into the clam cold climatic area), but also the lithopedogenetics condition (the cohesive rocs, the natural compacted soils horizons), the extension and the reduced development of the deep erosion induce relatively with other part of the country.

The specific form of the longitudinal soil's profile and their plane configuration, the transversal sections form of the torrential phenomena are the more important elements to the

deep erosion formation and development (RĂDOANE ET AL., 1999). But these elements, due to the local characteristics, low limitation to the agricultural practices require.

The characterization of agricultural land's usage, including the soils losses through the erosion processes can be made even if is known the real state of all the surfaces that are occupied with different usages, fact that now are impossible due to the fact that not exist a data base on land office. The only way is to discuss the situation of each area on the land office board, but even then there is a problem; these dates are probable because of the landholder's reticence.

MATERIALS AND METHOD

For these purpose two typical basins was identified, in areas with different characteristics of reception basin surface, altitude, the slope of the flank, the agricultural usages. Extrapolating these results, the dates nearer de mark regarding the sediment production we obtained. The estimation was made after the *Universal Soil Loss Equation* (USLE) by *Wischmeier and Smith* equation. This equation to the specific pedoclimatic conditions from our country was adapted. So an equation that is used in the soil erosion control practice was obtained.

RESULTS AND DISCUSSION

Due to the natural conditions of clime, soil and relief, but also due to the entropic activities, in Romania the soil erosion affects 6.367 million of hectare, respectively 43% of the agricultural surface of the country. The researches show that in a period of 40 years, surfaces of 5000 hectares are out of agricultural usage, due to the erosion and land slips processes.

Table 1.

The lands erosion intensity

The erosion class	The intensity variation limits (to/ha/year)	The medium intensity variation (to/ha/year)	The percent of the agricultural surface
The non estimable erosion	1	0,5	57.4
The low erosion	2-8	5	3.0
The moderate erosion	8-16	12.0	19.0
The high erosion	16-30	23.0	18.0
The very high erosion	30-40	37.5	2.6
TOTAL			100

The researches a general dimension of the total erosion phenomena on the country level, on the usages classes, established. This is shows in table 2.

Table 2.

The total erosion on the country level

The lands usage	The total erosion	
	mil. to/year	%
Arable (A)	21.0	16.8
Pasture (Ps)	52.0	41.2
Fruit tree plants (Lv)	2.1	1.7
Win growing plants (Vn)	1.7	1.2
Deep erosion	29.8	23.6
Total of agricultural lands	**106.6**	**84.5**
Growing stock	6.8	5.5
Bank erosion	12.6	10.0
TOTAL	**126.0**	**100.0**

The directly erosion's effects are: the soil's fertility decrease, the surface of agricultural lands decrease (it is know that in Romania a 450000ha are unproductive), the hydrological disequilibrium existence (due to the fact that the river flooding potential increase and the storage lake are clogged). That's that explain the experts attention on these subject.

The estimation was made after the *Wischmeier and Smith* equation. This equation to the specific pedoclimatic conditions from our country was adapted. So an equation that is used in the soil erosion control practice was obtained. This equation is:

$$\mathbf{E = K_a \cdot S \cdot C \cdot C_S \cdot L^m \cdot i^n (to/ha/year)}$$

After calculation next values of the erosion, on different agricultural usages was obtained.

Basin 1: Satului Valley
Total surface = 62.34ha
Emp A =257.24/36.00 = 7.14 t/ha/year
Emp Ps =152.72/13.2 = 11.56 t/ha/year
Emp Tf = 1.02/11.25 = 0.09 t/ha/year
Emp Np = 39.97/1.89 = 21.14 t/ha/year

Basin 2: Bistra Mărului Valley
Total surface =121.30 ha
Emp A =259.62/32.1 = 8.08 t/ha/year
Emp Ps = 231.78/22.45 = 10.32 t/ha/year
Emp L = 240.59/34.75 = 6.92 t/ha/year
Emp Tf = 2.59/26.45 = 0.09 t/ha/year
Emp Np = 205.03/7.50 = 30.82 t/ha/year

The medium specific erosion, on the agricultural usages is presents in table 3.

Table 3.

The medium specific erosion, on the agricultural usages

Usages	Erosion (to/ha/year)
Arable (A)	7,61
Pasture (Ps)	10,94
Unproductive lands(Np)	25,98
Fruit tree plants (L)	6,92
Agricultural lands with scrubby (Tf)	0,09

Surface erosion releaser factors identification

The most important releasing surface erosion's factors, in the studied area are the water erosion, because of the flank's slope and exposition, the soil's texture.

Affected by hydric excess are the most soils that have a fine texture and an advanced compacted stage. The defective physic and hydrophysic characteristics of these soils are determinate by the properties of evolution processes and by the natural conditions from the west area of Romania. This part of country passes a period with hydromorphism characteristics that was named by the researches "sludge period" (INCDIF, 2007).

Another factor that influences the erosion processes in the area of Bistra basin is the rock's lithology, because in these area the lithology is clayey, especially smectitic.

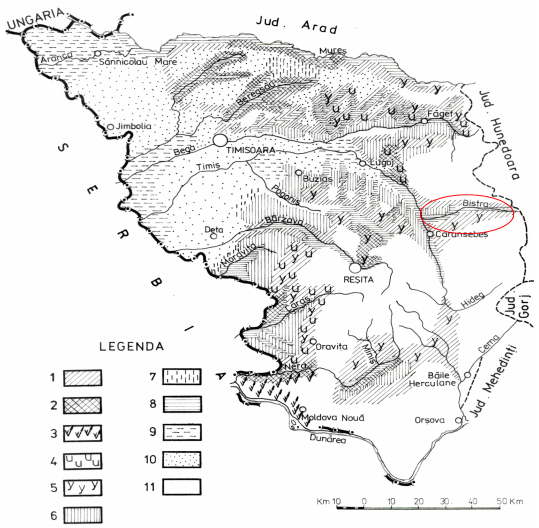

Figure1. Maps of erosion in Banat

Legend:

1. High-moderate water erosion
2. Very high and excessive water erosion
3. Wind erosion
4. Stabilized land slips
5. Deep erosion
6. Pluvial humidity excess (frequently)
7. Pluvial humidity excess (periodically)
8. Phreatic humidity excess (frequently)
9. Phreatic and pluvial humidity excess
10. Unaffected lands by the degradations
11. Unexplored lands

CONCLUSIONS

Soil erosion is an important social and economic problem and an essential factor in assessing ecosystem function. Estimates of erosion are essential to issues of land and water management, including sediment transport and storage. For the soil's erosion control an antierosional systems implementation is necessary.

The soil's antierosional complex systems, next actions and measures contain:

- The distribution of agricultural usages on the flanks according with the relief and pedoclimatic conditions;
- Establish a channels system to controlled bleeding of the excess water from the flanks to prevent the deep erosion;
- Forest shelter-belt founding and flanks restocking (especially where the slope is more than 20^0);
- Badlands transformation into grassland;
- Deep erosion control through the gully erosion improvement;
- Land slips consolidation.

LITERATURE

1. RĂDOANE MARIA., RĂDOANE N., IONIŢĂ I., SURDEANU V., „The gully erosion – forms, processing, evolution", Editura Presa Universitară Clujeană, Cluj-Napoca, 1999.
2. RĂDOANE MARIA, RĂDOANE N., „Risks and hasards", Ed.Casa Cărţii de Ştiinţă, Cluj-Napoca, pg. 57-68, 2004.
3. INCDIF "ISPIF" Bucureşti Banat Branch Office „Soil's erosion control study and the torrential basin improvement on the conventional hydrographic space", Bucureşti, 2007.