

## Impact of hydrotechnical arrangements on land resources of Banat

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**Abstract:** In this paper are presented soils in Banat, their evolution and hydraulic works which were executed before 1989. Current situation is compared with this time and there is a continuous degradation of the works that have been executed or even their disappearance. Upgrading of drainage pumping stations not help, when come rainy years we will have grave problems: pumping station used with machines physically damaged, clogged drainage channels, water suction basins degraded, etc. If the central level will not adopt another strategy for land reclamation works, agriculture and especially environment will suffer.

**Keywords:** land resources, factors of pedogenesis, drainage, irrigation, soil erosion, pumping stations, water suction basins.

### 1. INTRODUCTION

Current soil cover from Banat is the result of interaction of factors pedogenesis of the zone (parent material, climate, vegetation, relief) interaction performed in the past 10,000 years and that after the quaternary glaciation and present interglacial beginning. As a result soils reflect zoning relief - climate-vegetation, still wearing strong impression material parental respective parent rocks. The mountain soil blanket is thin and discontinuous, formed on eluvial deposits from alteration "in situ" of crystalline schists from Godeanu, Țarcu, Semenic, Poiana Rusca and Almaj, in wet and cold climate conditions and an alpine meadows and coniferous vegetation.

Predominate: *spodosoluri* (*podzoluri*), *cambosoluri* (*districambosoluri*), *umbrisoluri* (*humosioluri*) and *protisoluri* (*litosoluri*).

The level of Jurassic limestones from Almaj and Anina Mountains, as well as the mountains of Cerna and Mehedinti determined soil formation: *cambisolurile* (*eutricambosoluri*), *cernisoluri* (*rendzine*), *eutricambosoluri*, *protisoluri* (*litosoluri*), and *protisoluri* (*regosoluri*). Soils in the western piedmont hills and intermountain depressions are characterized by the predominance of *luvisoluri* (*luvosol stagnogleizat*). On low inclined or flat terraces were formed *hidrisoluri*, *stagnosoluri*, where rainwater can stagnate for months. The largest areas

occupied by *luvisols* *luvosoluri* occurring Almaj depression, southern of Pogăniș hills, the Oravița hills and in the south and west of Lipova hills.

On large terraces of rivers Timis, Bega and Caras in the eastern part of Lipova hills are spread *luvisoluri*.

High energy of relief and large amount of rain leaks caused soil profile truncation and appearance on large surfaces of *antrisolurile* and *regosols* *antrisoluri* and *regosoluri*. Lenticular presence of marls and clays on Lipova, Doclin, Oravița hills and on depressions of Almaj or Timis-Cerna passage, favored the development of landslides. In this slopes, under the influence of coastal springs occur *faozems* *faoziomuri* in association with *eutricambosoluri*, *preluvosoluri* and *regosolurile*.

On the wires of valleys of hilly area meet *gleiosoluri* and *ahuviosoluri*.

The next step pedo-geomorphological in order of emersions and release from Pannonian Sea, is one of the high plains of Piedmont.

Soils in this area are evolved on clayey material in the Vinga plains, and loamy (sometimes clay inflatable) in the Gătaia and Oravita plain. Consequently predominate *preluvosoluri*, respectively *vertosoluri* or soils with vertic characters on clay inflatable. It should be emphasized for *vertosoluri* and soils with vertices characters poor internal drainage that causes the process stagnogleyization.

A special mention for the high plain from Locvei foothills and strip of the Danube Clisura (between Bazias and Berzasca) where on loess and loess deposits in climate with Mediterranean influence *cernoziomuri* were formed.

Low plain of Banat currently affected by active subsidence phenomena in Csongrad-Szeged and Alibunar, are generally characterized by a pronounced hydromorphism, so there were large areas of swamps and marshes fed by rivers that permanent bum until 1716 when they were initiated swamp reclamation works, the dam and regulating the two main rivers: Bega and Timis. Following these works that have changed the natural environment, current soil cover consist of *gleiosoluri* and gleyed or gleyic *vertosoluri*

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in association with *salsodisoluri* (plain Aranca, Moravița and Cenei-Ionel- Livezile).

High areas with better drainage, covered with loess materials on that have evolved most fertile and valuable soils of Banat (*cernoziumuri*, groundwater wet or gleyed (Jimbolia - Grab – Lovrin)).

Soil cover from areas of Banat rivers digression is characterized by a great diversity due to the variety of parent material and microrelief.

Higher lands covered by *cernoziumuri* (wet or gleyed groundwater) and the lowest were excessive groundwater and therefore dominant soils are: *hidrosoluri* (*gleiosoluri*), *solsodisoluri* (*soloneturi*) and *hidrisoluri*.

Floodplain areas of Banat and especially Mures Bega, Timis and Caras valley, subject to periodic flooding and deposition of alluvial material has a specific coating of *aluvsoluri*, with whom there is a great diversity of soils in both the transverse profile of the river flood plain and large differences between the major stream bed of the middle and lower channel.

Due to the regularization and damming of rivers Timis and Bega disappeared almost completely regular flooding (there were only certain sectors) so that the undeveloped floodplain soils have evolved over the last 200 years to soils characteristic of the area.

It thus appears that piedmont hills area is affected by excess water from rainfall that caused the erosion slopes and on relatively flat terraces-*stagnogleyization*.

At the same time, all low plain of Banat is under the influence of a high groundwater level (in the past 10 years it has decreased considerably due to drought).

This situation called for execution of extensive land reclamation works (before 1989) Table 1, to eliminate restrictive factors for agricultural plant growth: soil erosion control works, drainage and irrigation ditches and pedoameliorative works (calcium and gypsum amendment, scarification, shaping land, drainage mole, washing of salts, etc.) and agroameliorative works.

As mentioned in existing documents hidroameliorative works in Banat, began in the eighteenth century and continued permanent, with different intensities far. The largest hidroameliorative works were executed in Timis county, which otherwise has the largest agricultural area.

Execution situation of land reclamation works executed in Banat until 1991 is presented in Table 1. (after organization before the year 1991).

## 2. MATERIAL AND METHOD

Table 1. Land reclamation works carried out in Banat

Nr. Crt.	The system	Year of commissioning	Total (ha)	Of which:			
				draining	drainage	irrigations	CES
TIMIS COUNTY							
1	Aranca	1974-1977	55582	55582			
2	Muresan	1981	6040	6040			
3	Sînnicolau-Saravale	1985	19998	19998			
4	Galatea	1956-1958	8282	8280			
5	Checea-Jimbolia	1974-1976	54451	54451			
6	Vinga-Biled	1971-1973	25530	25530			
7	Uivar-Pustinis	1985-1988	5403	5403			
8	Răuti- Sînmihai	1958-1962	5128	5128			
9	Begheiu vechi-Timisoara vest	1986-1989	10500	10500			
10	Behela	1971	1662	1662			
11	Fibis- Alios	1986	3207	1588			1619
12	Ghiroda –Recas	1968-1971	13921	8874			5047
13	Recas-Chizătău	1974-1975	5419	3500			1919
14	Minis -Chizdia	1974-1975	18487	15076			13411
15	Glavita	1973-1975	8486	8486			
16	Hîtias -Costei	1971-1972	1914	384			1530
17	Teba-Timisat	1987-1989	28063	28063			
18	Bociar	1987-1988	4126	4126			
19	Caraci	1980-1982	5503	5503			
20	Rudna-Giulvăz	1981-1983	5643	5643			
21	Sag-Topolovăt	1978-1982	39129	27653	4260	7216	
22	Sud Lunca - Birda	1968-1970	9984	9984			
23	Timisul Mort	1967-1969	19692	19692			
24	Nord Lunca-Birda	1969-1971	28519	28519			
25	Pogănis	1973-1975	11069	11069			
26	Surgani	1968-1970	7760	7760			

27	Cernabora	1972-1974	8310	8310			
28	Banloc	1982-1984	10196	10196			
29	Livezile	1983-1984	5462	5462			
30	Partos	1990-1991	2826	2826			
31	Moravita	1981-1984	17480	12700			5140
32	Bîrzava	1987-1989	13464	13464			
33	Roiga	1970-1972	6855	6855			
34	Beregsău	1976-1979	1513	1513			
35	Folea-Cerna	1988-1989	1837	1837			
36	Bethausen-Ohaba	1988-1989	4779	533			4246
37	Fădimac-Cladova	1988-1989	4771				4771
38	Perimetru CES Lugoj	1984-1985	720				720
TOTAL TIMIS COUNTY			482069	432190	4260	7216	3843
ARAD COUNTY							
39	Secusigiu-Felnac	1980-1984	8000	8000			
40	Sag- Fintînele	1968-1974	10000			10000	
TOTAL ARAD COUNTY			18000	8000		1000	
CARAS SEVERIN COUNTY							
41	Cadar-Remetea		6782	1782			5000
42	Bocsa- Sosdea		4400	3300			1100
43	Vermes		826				826
44	ISCIP Berzovia		552	552			
45	Bocsa –Biris-Doclin		3977	1477			2500
46	Dalboset -Pîrlipăt		6970	970			6000
47	Tău-Ezeris		450	30	20		500
48	Timis Superior		1116	177			939
49	Bistra – Otelu Rosu		2885	1885	50		950
50	Bistra-Poiana Mărului		860				860
51	Vrani - Mercina -aduc		980	980			
52	Vrani - Mercina -aduc		5000	3770	30		1200
53	Greoni- Ticvani		2509	2009			500
54	Fortic-Surduc		2381	281			2100
55	Văradia-Secăseni		7925	2100	50		5775
56	Vicinic		5017	1817			3200
57	Iam - Ciortea		993	993			
58	Moldova Nouă- Belobresca		4007				4007
59	Bîrzava Mijlocie		3323	251			3071
TOTAL CARAS SEVERIN COUNTY			70599	25810	879		43910
TOTAL BANAT			570668	466000	5139	17216	83313

It can be appreciated that a large part of agricultural land from Banat is in improvement systems executed. These hidroameliorative systems have been executed over 21 years ago and it can be said that the soil cover and process meta-pedogenesis are not net visible.

Some changes may be visible in the soil profile without being taken unfortunately scientifically rigorous control measures.

Thus, extensive drainage works caused lowering of ground water level on almost the entire low plain area so intense that lost additional source of water comes from groundwater. Hydromorphic characters (*gleyzation-stagnogleyzation*) became relics, but appeared irrigation requirements for filling water scarcity.

Also as a result of the development work, consider that it is, intensifying in low plain of alkalization-salinisation processes, process requiring cessation and prevention measures.

A particular extension knows compaction-dusting phenomena in all agricultural soils. These phenomena are correlated with the number of over-processing outside the optimal soil moisture and alarming decline in the percentage of humus that influenced low fluid and mechanical resistance of structural aggregates. Moreover, it is also the cause of large amounts of suspensions in water drainage on slopes.

Besides the negative aspects, it is clear many gains for the soil and thereby for agriculture of land reclamation works carried out, such as:

- Expansion of agricultural areas by sanitation, draining, damming and regulation;
- Eliminate the negative effects of excess water;
- Prevention and control in some areas of hill of erosion phenomena;
- Provide moisture deficit in drought conditions, of irrigated land.

### 3. CONCLUSIONS

- Banat soil coating, product of millennia evolution carries the mark of human activity, especially the land reclamation works started 200 years ago and agricultural works.

- It requires an absolute necessity to establish a scientifically rigorous control and prevent soil degradation and pollution in the perimeters improvement.

- Legislative measures must be taken to maintain in working order the perimeters improvement constructed.

- Excessive drought in recent years has highlighted the even greater importance of the irrigated area (lack of irrigation arrangements in Banat).

- Degradation of land reclamation works carried out in Banat by lack of money and staff reductions will lead to soil degradation phenomena with major impact over the environment and population.

### REFERENCES

[1] *Blaga Gh., s.a.* "Pedology", Ed. AcademicPres, Cluj Napoca, 2005

[2] *Constantinescu Laura* "Evolution of soils in drainage system Aranca" PhD-thesis, Timișoara, 1997;

[3] *I, Nemeș, ș.a.*, " The study of soil erosion in area Bozovici-Resita-Ezeris" International Scientific Conference, University of Miskolc, 2007

[4] *Rogobete Gh., "* Agricultural land degradation from Banat through erosion accelerated phenomena "- Conference" hydraulic systems in environmental", Timișoara, 1991

[5] *Rogobete Gh, I., Nemeș,* "Erosion hazard and surface runoff in the agricultural and forest soils from hydrographical basin Bârzava, Caraș Severin County" The 2<sup>nd</sup> International Symposium- "Preventing And Fighting Hydrological Disasters"-29June-01 July 2006, pg.66 ISBN 978-973-638-263-5, 2006.

[6] *Rogobete Gh, Tarau D.* "Soils and their improvement. Banat Map soil" Ed. Marineasa, Timisoara, 1997.