

# Degraded lands and afforestation in Timiș county

Adia Grozav<sup>1</sup>

Gheorghe Rogobete<sup>2</sup>

**Abstract:** In relation to atmospheric circulation, the soils in the investigated perimeter are in an intertwining zone of wetter air masses in the west, with the continental air drier in the east, causing a temperate continental climate, plus influences Mediterranean in southern Europe. Relief stepped, determines the distribution of vertical and horizontal of all elements of the environment, reflected in the distribution of the natural setting of vegetation: in the areas of low plains in the southwestern territory distinguished steppe and forest steppe followed the forests, plains, hills and mountains with forests of oaks, beech and coniferous and on mountain peaks subalpine and alpine meadows. As a result of interaction of pedogenetic factors, resulted in a large population of soils having specific characteristics, evolving, related or distinct differ by their properties, productive capacity and measures to preserve and enhance fertility. According to Roman Soil Taxonomy System (SRTS-2012) was identified 23 soil types and subtype, including 11 of the 12 soil classes. **Keywords:** soil, degraded land, afforestation, survey

## 1. INTRODUCTION

Banat region is considered an area with fertile soils.

In reality, the area was transformed by man since 1900, major hydraulic works and land reclamation, radically transformed the surface of this territory.

It was increased more the arable land in the piedmont and subsidence plain and has expanded the arable and in the hilly area through deforestation.

As a result, there was numerous areas of degraded land, that land with reduced fertility, a series of phenomena such as compaction, sheet erosion and gully erosion, salinisation and sodication problems, excess of phreatic water.

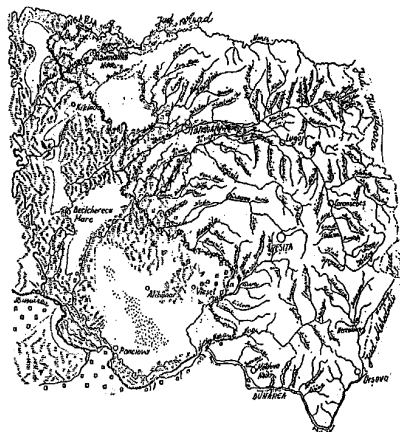


Figure 1. Historical Banat - geographical positioning

## 2. MATERIALS AND METHODS

This article will present and discuss of degraded lands and proposal for afforestation in Timiș county.

The study is based on a detailed soil survey effectuated in the years 2000-2016 in the Banat region, especially of the Timiș county.

The objective was to achieve a vision on soil at large scale in order to know the soil cover and their characteristics about affected soils.

## 3. RESULTS AND DISCUSSIONS

The greater part of the historical Banat is located in southwestern Romania, totaling a surface area of 1891694 ha (table 1) of which 1183343 ha are agricultural land (62.56), which administratively belong in Timis, Caras-Severin, partially Arad county (south of Mures area) and Mehedinți (several municipalities located in the Orșova)

Table 1. The surfaces structure for the major land use

	<i>Timiș</i>		<i>Caras-Severin</i>	
	<i>ha</i>	<i>%</i>	<i>ha</i>	<i>%</i>
arable	528242	60,74	126873	14,89
pasture	123552	14,21	183341	21,52
hayfield	28535	3,28	74562	8,75
vineyard	4695	0,54	111	0,09
orchard	8393	0,96	11452	1,35
agricultural land	693417*	79,73	396999*	46,60
forest	109465	12,59	411276	48,27
other	66783	7,68	43701	5,13
Total	869665	100	851976	100
	<i>Arad</i>	<i>Mehedinți</i>	<i>Total</i>	
	<i>ha</i>	<i>ha</i>	<i>ha</i>	<i>%</i>
arable	64620	1315	721050	38,12
pasture	15500	2577	324970	17,18

<sup>†</sup> Faculty of Civil Engineering, Department of Hydrotehnica, George Enescu Street No. 1/A, 300022, Timișoara, e-mail: adia grozav@yahoo.com

hayfield	4573	2418	110088	5,82
vineyard	222	22	5710	0,30
orchard	1605	75	21525	1,14
agricultural land	86520	6407	1183343	62,56
forest	26168	25558	572467	30,26
other	6257	19143	135884	7,18
Total	118945	51108	1891694	100

The great structural diversity and socio-economic driven mostly by landforms, is reflected in the allocation of agricultural land (table 2) gives a specific characteristic of Banat area.

Table 2. Land use distribution in the major landforms

Relief		Subsidence plain	Piedmont plain and terrace	Hills and terrace	Mountains and depression
arable	ha	355549	201606	126112	37783
	%	49,31	27,96	17,49	5,24
pasture	ha	54107	37274	109710	123879
	%	16,65	11,47	33,76	38,12
hayfield	ha	10998	10326	34105	54659
	%	9,99	9,38	30,98	49,65
vineyard	ha	1129	1467	3053	61
	%	19,78	25,69	53,47	1,06
orchard	ha	3061	3373	12099	2992
	%	14,22	15,67	56,21	13,90
agricultural land	ha	424844	254046	285079	219374
	%	35,90	21,49	24,08	18,53

Land use in the major landforms account a total of 721050 ha arable, 324970 ha pastures, hayfields 110088 ha, 5710 ha vineyards, orchards 21525 ha, a total of 1183343 ha of agricultural land.

In subsidence plain and meadows, arable land is 83.68%, 12.74% pasture, 2.59%, hayfield, 0.27% vineyards, 0.72% orchards; in the piedmont plains and terraces, the highest percentage it has arable land 79.36%, 14.67% pasture, 4.06% hayfield, 1.33% vineyards, orchards 0.72%. The hills and terraces occupy arable 44.24%, 38.48% pasture, 11.96% hayfield, 1.08% vineyards, 4.24% orchards. Mountains and depressions dominate by pasture, 56.47%, hayfields is 24.92%, 17.22% occupy arable land, 0.03% vineyards and 1.36% orchards.

Table 3. Main types of soil in Banat

WRB-1998	Arable	Pasture	Hayfield	Vineyard	Orchard	Forest
	ha %	ha %	ha %	ha %	ha %	ha %
Leptosol	72 0,01	20668 6,36	11636 10,57	- -	32 0,15	1947 0,34
Regosol	- -	44358 13,65	6121 5,56	82 1,44	1974 9,17	4465 0,78
Arenosol	1154 0,16	195 0,06	11 0,01	9 0,15	6 0,03	687 0,12
Fluvisol	68500 9,50	20766 6,39	11537 10,48	67 1,17	321 1,49	11220 1,96
Chernozem	155026 21,50	6629 2,04	1343 1,22	517 9,05	635 2,95	744 0,13
Phaeozem	38216 5,30	650 0,20	1365 1,24	199 3,50	745 3,46	573 0,10
Rendzic	-	1820	892	-	258	7671
Leptosol	-	0,56	0,81	-	1,20	1,34
Humic	-	2600	-	-	-	973
Umbrisols	-	0,80	-	-	-	0,17
Cambic	-	2405	-	-	-	1030
Umbrisols	-	0,74	-	-	-	0,18

Entric Cambisol	73979 10,26	39257 12,08	17460 15,86	211 3,69	1427 6,63	197043 34,42
Dystric Cambisol	54800 7,60	67853 20,88	23240 21,11	-	413 1,92	49461 8,64
Halpic Luvisols	130654 18,12	12284 3,78	2477 2,25	1786 31,28	4566 21,21	90908 15,88
Albic Luvisols	110321 15,30	31847 9,80	9886 8,98	154 2,70	4766 22,14	163668 28,59
Planosols	3605 0,50	1202 0,37	231 0,21	20 0,35	187 0,87	-
Cambic Podzols	793 0,11	1754 5,54	-	-	-	859 0,15
Halpic Podzols	2163 0,30	2210 0,68	-	-	-	5667 0,99
Vertisols	58117 8,06	32498 10,00	3765 3,42	23 0,40	480 2,23	9675 1,69
Gleysols	8076 1,12	16703 5,14	15985 14,52	-	-	4294 0,75
Stagnosols	3533 0,49	3249 1,00	2697 2,45	-	-	10190 1,78
Solonetz	7355 1,02	12772 3,93	936 0,85	-	-	-
Histosols	-	390 0,12	-	-	-	-
Anthrosols	3677 0,51	1690 0,52	121 0,11	2625 45,97	5588 25,96	-
Technosols	1009 0,14	1170 0,36	385 0,35	17 0,30	127 0,59	11392 1,99
Total ha	721050	324970	110088	5710	21525	572467

From the total area of Timiș county, it appears that 869665 hectares are affected by degradation phenomena or are occupied by problematic soils for agriculture.

Table 4. Degraded lands in Timiș county

Communal territory	Area (ha)	Sheet erosion (ha)	Gully erosion (ha)	Landslide (ha)	Excavation +deposits (ha)
Timișoara	230.0				
Lugoș	1047.5	173.5	77.5	84.5	
Buziaș	557.5	311.0	25.5		
Deța	206.3				29.0
Jimbolia	287.5				
Sânnicolau Mare	633.0				
Balint	734.5	275.0			
Banloc	1327.5				
Bara	1483.0	486.0		14.5	
Beba Veche	341.0				
Becicherecu Mic	757.0	6.0			
Belint	1668.5	8.0		11.0	
Bethausen	982.5	148.5	24.5		
Biled	16.0				
Birna	612.5	113.5			
Bogda	580.0	526.0	18.0		
Boldur	370.5	29.5			5.0
Brestovăț	477.0	372.0	64.0	8.5	10.0
Cărpiniș	29.0				
Cenad	930.8				
Cenci	410.0				
Chevereșu Mare	246.0				
Ciacova	2247.0				
Comloșu mare	661.0				
Costeiu	1420.0	331.0		78.0	
Criciova	1020.0	121.0		144.0	
Curtea	580.0	82.0	38.0		
Darova	1619.0	630.5	298.0		
Denta	714.0	45.0			
Dudeștii vechi	204.0				

Dumbrava	333.0	44.0	2.0		
Făget	867.0	250.0	65.0		
Firdea	797.0			224.5	16.5
Foeni	2311.0				
Găvojdia	1611.0	56.0			
Gătaia	1294.0	306.5			
Ghizela	653.0	169.0	42.5		
Giarmata	2060.5	40.0			
Giera	1830.0				
Giulvăz	2681.5				
Jamu mare	1183.0	153.0	42.0		
Jebel	273.0				
Lenauheim	149.0				
Liebling	368.0				
Lovrin	440.0	68.5			
Margina	1691.0	126.0		109.0	
Mașloc	508.5	166.5	96.5		
Mănăstur	111.0	53.0	8.0		
Moravița	1123.0	65.0			
Moșnița Noua	175.0				
Nădrag	164.0	30.0		70.0	
Nițchidorf	260.5	61.5			30.0
Ohaba Lunga	953.0	885.5			
Orțișoara	2183.8	1640.0			
Peciu Nou	727.5				
Periam	391.5				
Pietroasa	1028.0				
Pișchia	1178.0	902.0			
Racovița	504.0			5.5	
Recaș	1.743.0	1092.0		54.0	
Remetea Mare	1.245.5			87.5	
Sacoșu	78.0				
Satchinez	1.096.0	359.5			
Săcălăz	661.0				
Secaș	1.117.5	773.0		317.0	
SinAndrei	347.0	272.0			
Sinmihaiu R	48.0				
Sinpetru M	1.315.1				
Șag	838.5				
Știuca	1.584.5	438.5		429.0	
Teremia Mare	288.0				
Tomești	219.0	21.0			
Topolovățu Mare	414.0	63.0			
Tormac	1.536.5			5.0	
Traian Vuia	426.5	16.0	15.5	7.0	
Uivar	600.5				
Variaș	359.5				
V.V.Delamarina	1.065.0	811.0	58.0	75.0	
Voiteg	400.5	12.5			
Giroc	401.0				10.0
Ghiroda	128.0				
<b>Total</b>	<b>66155.0</b>	<b>12533.5</b>	<b>875.0</b>	<b>1724.0</b>	<b>100.5</b>

There are areas with poor fertile land:

- Vertisols with a total of 400 ha in Săcălăz area;
- 1199 ha Leptosols arranged as follows: 7 hectares at Dumbrava, 132.5 ha at Firdea, 67.0 ha at Margina, 115.5 ha at Traian Vuia; the largest area of 868 ha is in Pietroasa

Leptosols shows a low water retention capacity and a low edafic volume. Biological activity is more intense when these soils developed on basic materials, biogenic activity is temporarily inactive in winter or the dry.

- Arenosols with a total of 803ha: Periam have an area of 241 ha and 562 ha at Comlosu Mare.

For a better understanding of the afforestation needs in the table 5 are showed the Solonetz and Salic soils, the areas occupied by excess of phreatic water, flooding surfaces and absent drainage.

Table 5. Areas with humidity excess

Communal Territory	Solonetz and Salic Soils (ha)	Excess of phreatic water (ha)	Inundation (ha)	Absent drain (ha)
Timișoara	115.0	115.0		
Lugoj		20.0	605.5	86.5
Buziaș		26.0		195.0
Deta	7.3		120.0	50.0
Jimbolia		137.0		150.5
Sănnicolau Mare	477.5		155.5	
Balint			449.5	10.0
Banloc	1235.0	92.5		
Bara		500.0	405.0	77.5
Beba Veche	268.0			73.0
Becicherecu Mic	580.0	31.0	140.0	
Belinț			1600.0	49.5
Bethausen		77.5	3.5	728.5
Biled		16.0		
Birma		6.0	493.0	
Bogda		36.0		
Boldur			336.0	
Brestovăț				22.5
Cărpiniș				29.0
Cenad	54.2	8.6	868.0	
Cenei	396.0		14.0	
Chevereșu Mare		55.5	111.5	79.0
Ciacova	860.5	386.5	1000.0	
Comloșu Mare	19.5		79.5	
Costeiu		106.5	852.0	52.5
Criciova			746.0	9.0
Curtea			423.0	37.0
Darova		22.5	668.0	
Denta	14.0		410.0	245.0
Dudeștii vechi	39.0		165.0	
Dumbrava		106.0	19.0	155.0
Făget		200.0	190.0	162.0
Firdea			390.5	33.0
Foeni	1405.5	43.5	862.0	
Găvojdia			1175.0	380.0
Gătaia			746.5	241.0
Ghizela				441.5
Giarmata		110.0	1792.0	118.5
Giera	1330.0		500.0	
Giulvăz	2066.5		615.0	
Jamu mare			568.0	420.0
Jebel	238.0	35.0		
Lenauheim				149.0
Liebling	163.0	79.0		126.0
Lovrin	56.5			315.0
Margina			1233.0	156.0
Mașloc		54.0	48.0	143.5
Mănăstur		35.0	15.0	
Moravița	265.0		40.0	753.0
Moșnița Noua	13.0		162.0	

Nădrag		60.0		4.0
Nițchidorf				169.0
Ohaba Lunga			58.5	9.0
Orțișoara	13.6	40.0	464	26.2
Peciu Nou	661.0	16.5	50.0	
Periam	43.0	3.5	104.0	
Pietroasa			157.0	3.0
Pișchia		237.0		39.0
Racovița			491.5	7.0
Recaș			516.5	80.5
Remetea Mare		806.0		352
Sacoșu Turcesc		33.0	45.0	
Satchinez	56.5		680.0	
Săcălaz	208.0	53.0		
Secaș			13.5	14.0
SinAndrei	9.0	35.0	31.0	
Sinmihaiu Român	48.0			
Sinpetru Mare	746.1		569.0	
Șag	130.5	8.0	679.0	21.0
Stiuca			550.0	167.0
Teremia Mare	79.0	24.0		185.0
Tomești			159.0	33.0
Topolovăț			306.0	45.0
Tormac			31.0	1500.5
Traian Vuia		72.0		200.5
Uivar	361.0	239.5		
Variaș	147.0	78.0	134.5	
Voiteg	123.0	220.0	45.0	
Giroc		203.0	150.0	38.0
Ghiroda	51.0			77.0
<b>Total</b>	<b>12280.2</b>	<b>4427.6</b>	<b>23235.5</b>	<b>8576.7</b>

Based on these degradations they were proposed for afforestation land affected by gully erosion and landslides in accordance with the following table.

Table 6. The areas proposed for afforestation

Commune territory	Afforestation area (ha)	Landlord	
		State	Private person
Lugoj	162	40.5	121.5
Buzias	25.5		25.5
Bara	14.5		14.5
Belint	11.0		11.0
Bethausen	24.5	15.5	9.0
Birna	89.5	30.0	59.5
Bogda	18.0	4.0	14.0
Brestovat	72.5	15.0	57.5
Costeiu	78.0		78.0
Criciova	147.0	137.0	10.0
Curtea	48.0	45.0	3.0
Darova	298.0	112.0	186.0
Dumbrava	9.0	9.0	
Faget	65.0	30.0	35.0
Firdea	357.0	326.0	31.0
Ghizela	42.5	6.5	36.0
Jamu Mare	42.0	16.0	26.0
Margina	189.0	63.0	126.0

Masloc	96.5	14.5	82.0
Manastur	8.0	4.0	4.0
Nadrag	70.0		70.0
Pietroasa	868.0	523.0	345.0
Racovita	5.5	5.5	
Recas	54.0	12.0	42.0
Remetea Mare	87.5		87.5
Secas	317.0	307.0	10.0
Stiuca	429.0	373.0	56.0
Tomesti	21.0	18.0	3.0
Tormac	5.0	4.0	1.0
Traian Vuia	138.0	77.5	60.5
V.V.Delamarina	136.0	44.0	92.0
<b>Total General</b>	<b>3928.5</b>	<b>2232.0</b>	<b>1696.5</b>

Because afforestation occupies a small area in Timiș county, proportional to the national average, we propose afforestation and other damaged or poorly fertile lands, so the afforestation area reach 25-30% of Timiș county area, and goes somewhere towards the national average.

#### 4. CONCLUSIONS

Eight major soil degradation processes confronting the European Union are: erosion, organic matter decline, contamination, salinisation, compaction, loss of soil biodiversity, withdrawal from agricultural use, landslides and floods.

Total area of Banat is 1891694 ha of which 1183343 ha are agricultural lands (62.56%), and there were identified as soils: Leptosol, Regosol, Arenosol, Fluvisol, Chernozem, Phaeozem, Luvisols, Podzols, Vertisols, Gleysols, Solonetz, Histosols.

The most fertile are Chernozem and Phaeozem.

#### REFERENCES

- [1] M., Dumitru, *Starea agrochimică a solurilor in Romania, Știința solului, seria III, Volume XXXVI, 2002, București;*
- [2] Gh. Rogobete, D. Țărău, *Solurile și ameliorarea lor, 1997, Edit. Marineasa, Timișoara;*
- [3] Gh. Rogobete, *Fenomene de subsidență a terenurilor agricole in județul Timiș, Analele Univ. Vest, Geografie, vol.2, 1993, Timișoara;*
- [4] Gh. Rogobete, D. Beutură, R. Bertici, A. Grozav, *Land degradation phenomena in the oldest paddy in Romania, 41th Croatian International Symposion on Agriculture, 2006, Opatija;*
- [5] D., Teaci, Gh. Rogobete I. Seceleanu, I. Popescu, *Experimental demonstration of vertic phenomena in some soils of the same category in Romania, the 14<sup>th</sup> ICSS., 1990, Kyoto, Japan;*
- [6] D. Țărău, Gh. Rogobete, I. Borza, I. Pușcă, C. Fomitescu, *Evolution of thenatural, ecopedological conditions in south west Romania as regards of production capacities, Soil Science, vol XXXVI, nr 1, 2002, București;*
- [7] *Ghidul Conf. XVII Timișoara, 2003, Ed. Estfalia, București;*
- [8] \*\*\*, *Lucrarile Conferinței Naționale pentru Știința Solului, 1985, Timișoara;*
- [9] \*\*\*, *Sistemul Român de Taxonomie a Solurilor - SRTS 2012, Editura SITECH, Craiova;*
- [10] \*\*\*, *Studii pedologice 2000-2016, OSPA, Timișoara;*