ASSESSING CRUDE OIL EXTRACTION DAMAGED AGRICULTURAL LANDS IN THE LOVRIN AREA (TIMIS COUNTY)

BONITAREA TERENURILOR AGRICOLE DIN ZONA COMUNEI LOVRIN, JUD. TIMIŞ, AFECTATE DE ACTIVITATEA DE EXTRACȚIE A PETROLULUI

L. NIȚĂ, Casiana MIHUȚ, M. STROIA, K. LAȚO

U.S.A.M.V.B.Timişoara
lucian_n@yahoo.com

Abstract: *In this paper the authors present the results of their research concerning the evolution, changes and fertility of the soils and, implicitly, of agricultural lands due to social and economic activities within the Lovrin area (Timis County). The paper aims at presenting the fertility potential of agricultural lands in the studied area and at identifying fertility limiting factors.*

Rezumat: *Prezenta lucrare continuă cercetările şi studiile prin evoluția, transformarea şi fertilitatea solurilor, respectiv a terenurilor agricole, prin activitățile social-economice desfăşurate în perimetrul comunei Lovrin, județul Timiş. Această lucrare are ca drept scop prezentarea potențialului de fertilitate a terenurilor agricole din zona studiată şi să identifice factorii limitativi ai fertilității.*

Keywords: *anthropic, agricultural land, assessment, oil*
Cuvinte cheie: *antropic, teren agricol, bonitare, petrol, evaluare*

INTRODUCTION

Improving and valorising yielding potential of agricultural lands in the area can be done by approaching hydro-ameliorative measures integrated with agro-pedo-ameliorative ones and with current crops that can ensure optimal functioning of the air and water regime in the soil.

MATERIALS AND METHODS

In order to calculate assessment grades characterising each soil unit within the soil study at Lovrin (Timis County), we took into account the most important features that easy and accurate to measure, and that can usually be found in soil study works as assessment indicators to which we added indicators specific to polluted soils.

Assessment grades for each land and crop use category were obtained by multiplying the coefficient product (directly involved in the calculus) 100 times.

$Y = (X_1 x X_2 x X_3 x X_4 x \ldots\ldots\ldots\ldots\ldots\ldots X_{17}) \times 100$

where:

Y = assessment grade

$X_1, X_2, X_3 \ldots\ldots\ldots\ldots X_{17}$ = the value of the coefficients of the 17 indicators

RESULTS AND DISCUSSION

The soils of the Banat's Plain taken globally have, at present, a high heavy metal content, i.e. 1.2-4.3 times higher than the general values of the soils in Romania. Maximum values characterise cadmium (Cd), cobalt (Co), and chromium (Cr), as well as other chemical elements that are close to the maximum admitted limits. The causes that favoured accumulation

of heavy metals are in the geo-chemical fund of the rocks and parental materials in the mountain area and in the way they are carried towards west, towards piedmont and plain areas.

In the area we studied, soil **microelement** supply (total forms) compared to the values of the current norms and standards is as shown in table 1.

Table 1.

Soil microelement supply at Lovrin (Timis County)

Microelement	Soil content* (ppm)	Supply state*	Normal value (ppm)	Alert threshold (ppm)	
				Sensitive use type	Less sensitive use type
			Ordinance M.A.P.M. 756/1997		
Cr	< 80	low	30	100	300
Mo	2 – 3	high	2	5	15
Mn	600-800	medium	900	1500	2000
Fe	20000 – 25000	low	-	-	-
Co	15 – 20	low	15	30	100
Ni	30 – 40	medium	20	75	200
Cu	21 – 30	medium	20	100	250
Zn	51 – 70	medium	100	300	700
Cd	< 1	medium	1	3	5
Pb	< 20	low	20	50	250

** data from literature*

a) Soils affected

TYPICAL BATIGLEIC CHERNOZEM

Morphological features

Aţelk – 0-5 cm, fallow layer mixed with mineral parts, medium clay, blackish, moderate effervescence

Amk – 5-50 cm, medium clayish, brown-blackish, with whitish spots at the basis, with well developed structure, small and medium glomerular, high porosity, not set, breakable, low plasticity, moderate to strong effervescence, CO_3Ca efflorescence, as well as biogenous new formations (lava nests, coprolites, crotovines, galleries)

A/Ckac – 50-75 cm, medium clayish, dark brown to dark grey, dense whitish spots; medium developed moderate structure, high to very high porosity, aerated – not set, very strong effervescence; numerous biogenous new formations (crotovines, coprolites, comevines, galleries and larval nests), as well as frequent new formations of soluble salt carbonates (effervescent spots, pseudo-mycelia).

Ccaac – 75-200 cm, medium clayish, yellowish-greyish towards the basis (below 164 cm), yellowish-rusty with purple spots, non-structured, effervescent, low setting, concretions of calcium carbonate and soluble salts

MOLIC PSAMOSOL

Morphological features

Amk – 0-40 cm, clayish sand, light brown due to the humus content, little developed granular structure, breakable, little compactness, little porous and aerated, effervescent

Ck – 40-100 cm, clayish sand, light yellow, non-structured, at the basis of Amk

Table 2.

Physical and chemical features of the typical batigleic chernozem

HORIZONS	Aţ	Amk_1	Amk_2	A/CkCca	$Ccag_2$	$Ccaac_2Go_3$	$Ccaac_3$ Go_4
Depths (cm)	0-5	5-18	18-50	50-75	75-140	140-165	165-200
Coarse sand (2.0-0.2 mm) %	0.3	0.4	0.3	0.2	0.3	0.3	0.5
Fine sand (0.02-0.02 mm) %	46.7	48.0	45.8	45.3	43.6	48.6	39.3
Dust (0.02-0.002 mm) %	22.7	22.9	23.8	23.5	25.7	26.2	23.2
Argyle 2 (sub 0.002 mm) %	30.3	28.7	30.1	31.0	30.4	24.9	32.0
TEXTURE	LL	LL	LL	LL	LL	LL	LL
Specific density (D g/cm^3)	2.53	2.55	2.53				
Apparent density (DA g/cm^3)	1.1	1.35	1.24	1.14			
pH (in H_2O)	7.92	8.01	8.32	8.46	8.62	8.59	8.51
Carbonates ($CaCO_3$%)	3.15	3.31	5.55	17.4	22.4	21.7	20.4
Humus (%)	3.82	3.53	2.92				
Mobile P (ppm)	71	72					
Mobile K (ppm)	66	62					

Table 3.

Physical and chemical features of the molic psamosol

HORIZONS	Amk	Ck
Depths (cm)	0-40	40-100
Coarse sand (2.0-0.2 mm) %	29.5	33.8
Fine sand (0.02-0.02 mm) %	48.7	48.9
Dust (0.02-0.002 mm) %	11.0	8.9
Argyle 2 (sub 0.002 mm) %	10.8	8.4
TEXTURE	UM	UM
pH (in H_2O)	7.1	7.10
Carbonates ($CaCO_3$%)	0.9	0.7
Humus (%)	1.12	1.04
Mobile P (ppm)	9.6	19.8
Mobile K (ppm)	72	52
T me/100 g soil	11.7	11.49
Exchange bases (SB me/100 g soil)	9.72	9.0
Base saturation degree (V %)	88	87

b) Assessing agricultural lands damaged by crude oil extraction

Analysing assessment grades (table 1) for different use categories (arable, grassland, haymaking field, vineyard and orchard) pointed out a uniformity of the production capacity of the soils affected by crude oil exploitation, i.e. with grades between 90 and 100 for the typical batigleic chernozem. The factor that determined the penalty for the use category arable, orchard and vineyard was gleysation; nevertheless, they range within the 1st fertility class. The lowest grades were in the mollic psamosol, where penalty was given by the sandy texture, which made it range within 2nd fertility class (table 4).

Table 4.

Crude oil extraction damaged agricultural land suitability at Lovrin (Timis County)

Soil	Batigleic chernozem		Molic psamosol	
Use	Assessment grade	Fertility class	Assessment grade	Fertility class
Arable	100	I	81	II
Grassland	100	I	90	II
Haymaking field	100	I	90	II
Vineyard	90	II	81	II
Orchard	90	II	81	II

The lowest values were on soils that were too aerated, with a high content of sand and with gleysation or salinisation processes in psamosol. Lower values were in potato, sugar beet,

soy, alfalfa, and vegetables, which ranged them within 3rd fertility class (assessment grades between 80 and 90). In batigleic chernozem, the values were higher, i.e. between 80 and 100, ranging it within 1st fertility class (wheat and maize) and in 2nd fertility class (barley, sunflower, sugar beet, soy, hemp, alfalfa, and vegetables (table 5).

Table 5.

Crude oil extraction damaged agricultural land favourability at Lovrin (Timis County)

Soil	Batigleic chernozem		Molic psamosol	
Crop	Assessment grade	Fertility class	Assessment grade	Fertility class
Wheat	100	I	81	II
Barley	90	II	81	II
Maize	100	I	90	II
Sunflower	90	II	81	II
Potato	81	II	73	III
Sugar beet	90	I	72	III
Soy	90	I	72	III
Hemp	81	II	81	II
Alfalfa	90	I	80	III
Vegetables	81	II	72	III

CONCLUSIONS

Research results allow us to draw the following conclusions concerning the yielding capacity of the agricultural lands at Lovrin (Timis County):

- batigleic chernozem is slightly affected by crude oil extraction, with very good physical and chemical features, and favourable to all crops or suitable for all use categories;
- mollic psamosol is favourable to most crops, ranging within the 2nd and 3rd fertility classes with a high yielding potential;
- soil heavy metal analysis in the studied area shows values slightly above maximum admitted limits (Mn and Zn) with no considerable impact on the physical and chemical features of the soil and, implicitly, on the yielding capacity.

LITERATURE

1. MUNTEANU I, 2000 –Asupra unor probleme privind studiile pedologice– Ştiinţa Solului, vol. XXIV, nr. 1, pag. 19-32
2. RUSU I., NIŢĂ L., STROIA M., DUMA-COPCEA ANIŞOARA, 2002 –Favorabilitatea solurilor din jud. Timiş pentru principalele culturi agricole – Lucrări Ştiinţifice, vol. XXXIV, pag. 35-40, TIMIŞOARA
3. ŢĂRĂU D., 2003 – Bazele teoretice şi practice ale bonitării şi evaluării terenurilor din perspectivă pedologică, Ed. Solness, Timişoara
4. ŢĂRĂU D ., 2003 –Cartarea şi bonitarea solurilor, Ed. Solness, Timişora