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THE POSSIBILITY OF PLANTING THE FAST-GROWING TREE SPECIES AT THE LANDFILLS OF THE KOLUBARA MINING BASIN

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BACKGROUND

The soil conditions in the surfaces produced by the surface mining of the ore, which need to be recultivated, are accompanied by numerous problems such as over wetting, lack of nutrients, poor functional activity, compaction and destruction of the soil texture. On the surface mine of field "B" in the settlement of Prkosava within the Kolubara mining basin in the Republic of Serbia (Coordinate: 7453715;4916566), a landfill was formed on which an area of 7.6 ha of deposol land was set aside for the cultivation of woody crops.

MATERIALS AND METHODS

Soil sampling was carried out at three positions, which are presented in Figure 1.
At two locations, composite soil samples were taken in a disturbed state for the purpose of determining the chemical properties of the soil from a depth of 0 - 30 cm. A soil profile was opened within which clearly differentiated soil layers were determined (since we are talking about deposols - anthropogenic formations).
Determining the chemical properties of the soil included: Active and substitutional acidity - pH in H_2O and 1M KCl - potentiometric (SRPS ISO 10390:2007), %$CaCO_3$ – volumetric by the Scheibler method (SRPS ISO 10693:2005),

Easily accessible phosphorus and potassium (mg/100g) - AL by the Egner-Riehm method, Humus (%) - by the Kotzman method, Total forms, Mn, Cd, Pb, Ni, Cr, Zn, Cu, Co (mg/kg) SRPS ISO 11047:2004, Fe (%) and As (mg/kg) - by digestion with HNO_3 and H_2O_2 and read on ICP. Determining the physical properties of the soil included: Mechanical composition - pipette method with preparation of samples with sodium pyrophosphate. Texture of soil classes - according to ISSS, Baize (1993).

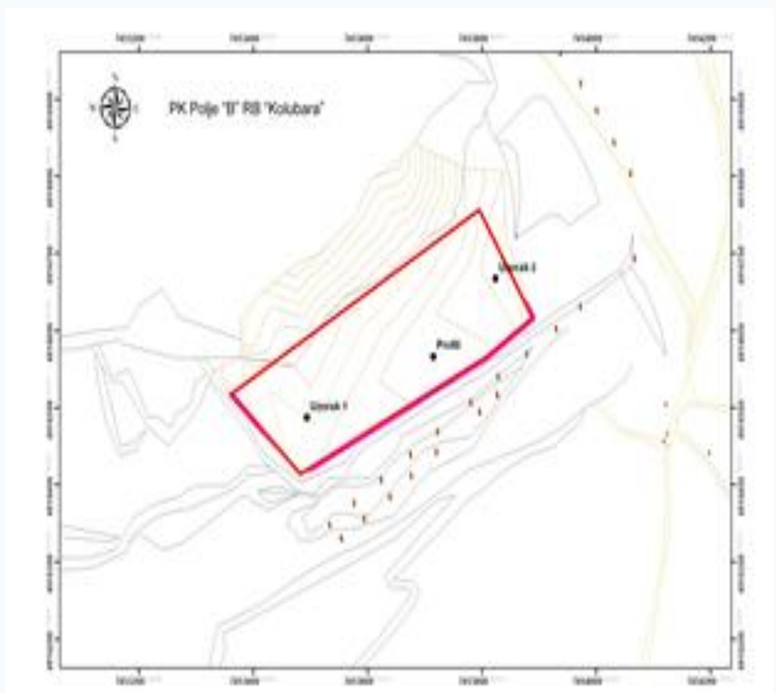
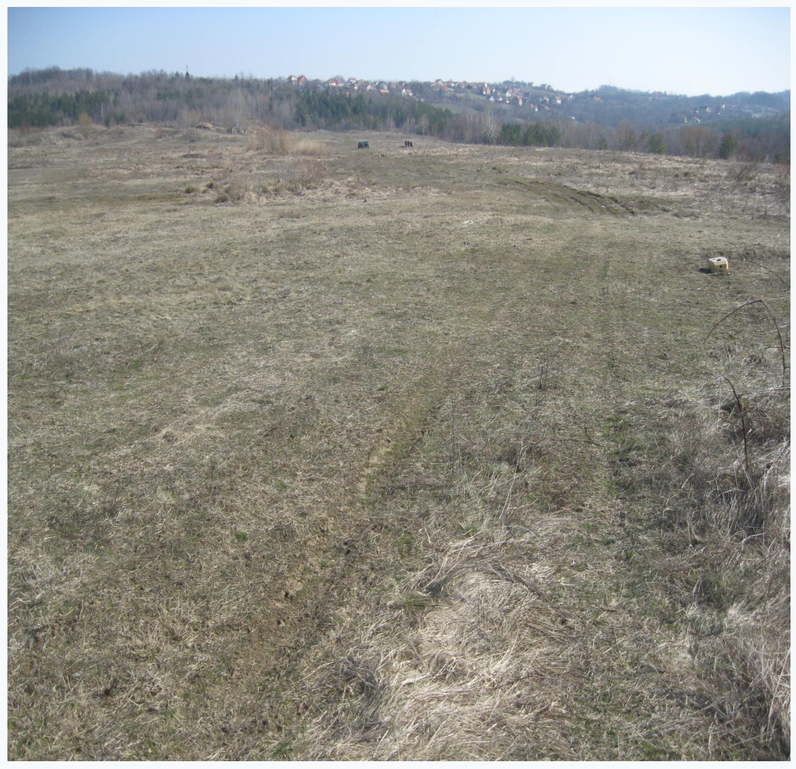
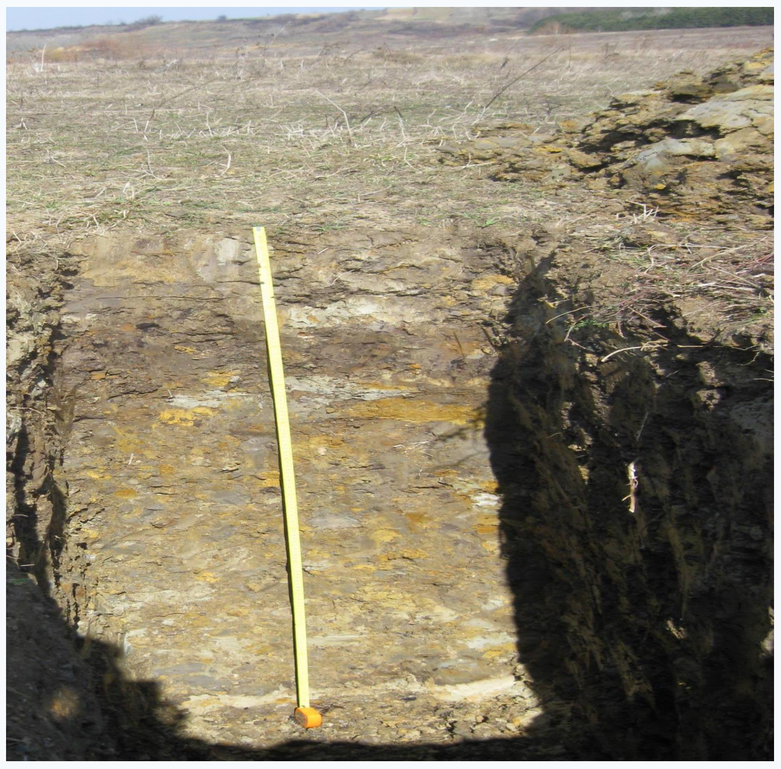


Fig. 1 Location of studied area





RESULTS

The results of the examination of the basic chemical properties show that these are deposited layers in which there is no lime, so their acidity ranges from neutral (sample 1) to weakly acidic (sample 2). They are moderately provided with humus, as well as with nitrogen. The supply of phosphorus is low in sample 1, and very low in sample 2, while the share of potassium is medium (sample 1) and high (sample 2).

Total content of individual microelements and heavy metals in the soil analyses of the total content of individual microelements and heavy metals in the deposols show that all elements are found in normal amounts, except for a slightly increased content of cobalt (Co) and significantly higher values for nickel (Ni) and chromium (Cr). The increased values of these elements are the result, most often, of their share in the parent substrate, especially in deposols because the substrate is often found on the surface, especially when layers are deposited from greater depths.

Granulometric composition analyses of the granulometric composition clearly show that the deposols in the first two layers (0-18 and 18-43 cm) belongs to clay, and in the other two (43-118 and 118-140 cm) to clay loam. The lowest values are for coarse sand, while fine sand and dust are within very similar limits. The clay fraction has the highest values, most likely montmorionite clay, which causes the soil to swell when it is wet, and to crack when it is dry.

A summary of the test results is given in Table 1. and Maximum allowed concentrations of hazardous and harmful substances in the soil in the Republic of Serbia in Table 2.

Table1. Test results

Nº	Coordinate		pH		$CaCO_3$ (%)	Humus (%)	P_2O_5 (mg 100 g^{-1})	K_2O (mg 100 g^{-1})
	x	y	(H_2O)	(1MKCl)				
1	7453494	4916487	7.60	6.60	0.00	3.34	8.16	23.08
2	7453824	4916667	7.50	6.40	0.00	3.57	3.31	25.88

Nº	Fe	Mn	Cu	Zn	Co	Cr	Pb	Ni	Cd	As
	(%)	(mg kg^{-1}) SRPS ISO 11047 (2004)								(mg kg^{-1})
1	25.00	548	22.28	66.9	21.06	127.10	26.59	139.80	0.48	8.82
2	31.17	505	22.66	71.20	19.87	144.20	32.61	145.60	0.47	8.21

Profile 1 Depth (cm)	Particle-size distribution (%)						Texture class
	Coarse sand >0.2mm	Fine sand 0.2-0.02mm	Silt 0.02-0.002mm	Clay <0.002mm	Total sand >0.02mm	Silt+clay <0.02mm	
0-18	1.7	24.7	22.6	51.0	26.4	73.6	G
18-43	2.9	26.2	26.6	44.3	29.1	70.9	G
43-118	5.5	25.8	31.0	37.7	31.3	68.7	GI
118-140	12.1	26.5	25.9	35.5	38.6	61.4	GI

Table2. Maximum allowed concentrations of hazardous and harmful substances in the soil

Element/Rule book	Cd	Co	Cr	Mn	Ni	Pb	Zn	Cu	As
	(mg kg^{-1})#								
Official Gazette 23/1994	3		100		50	100	300	100	25
Kastori et al.(1997)				400*					
Ordinance - Official Gazette 51/2002		30*							

CONCLUSION

Research has confirmed that the conditions for the production and cultivation of woody crops in the research area are good, and based on field observations, species from the association Populeto - Salicetum (poplar and willow) would be best suited, although success would also be good with Robinia pseudoacacia (acacia).

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