

Current hygienic state of agricultural soils based on soil monitoring system in Slovakia

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INTRODUCTION

Governmental soil policy of Slovakia declares that the soil is and will be the basics of environmental, ecological, economical and social potential of Slovakia and therefore it must be carefully protected against damage. The new regulation concerning agricultural soils is the Act n. 220/2004 collection of laws on protection of agricultural soils and land use in effort to increase protection against degradation. Background soils contain native heavy metals concentrations plus an anthropogenic addition by the ubiquitous deposition resulting from diffuse heavy metal sources. The understanding of the potential risk elements behaviour in the soil system is one of the most important tasks in evaluation of their immobilization and transport.

RESULTS

The highest values of **arsenic** content occur on Cambisols especially with existence of geochemical anomalies (mostly Cambisols on granitic, metamorphic and volcanic rocks). Average values of **cadmium** are the highest on Fluvisols (Table 1) as the result of its

transport along the rivers where anthropogenic and geogenic influence can be mixed. The variability of **cobalt** in the subsoil is higher opposite the topsoil. Difference of chromium content between topsoil and subsoil is very low. It means the content of **chromium** in soil profiles is even-tempered and reflects mostly the natural distribution of chromium in soils of Slovakia. The highest concentrations of **copper** were determined in some Cambisols and Fluvisols (the areas with geochemical anomalies occurrence and alluvial deposits with accumulated soil-sedimentary material from those areas). The average content of **nickel** is the highest on Fluvisols and Rendzic Leptosols (Table 1), what is in harmony with previous work. The highest values of **lead** were determined in Fluvisols where Pb was often accumulated on alluvial deposits in lower part of rivers. **Zinc** in conditions of Slovakia is common especially in areas with geochemical anomalies occurrence as well as in some alluvial deposits. The highest content of zinc was determined on Fluvisols – especially on alluvial deposits in lower part of rivers similarly as cadmium.

METHODOLOGY

The obtained results are evaluated on the basis of soil monitoring system in Slovakia, which has been running since 1993 year. Soil monitoring network in Slovakia is constructed on ecological principles and includes the important data of all main soil types and subtypes, soil substrates, climatic regions, emission regions, contaminated and non-contaminated regions as well as various land use. There are 318 monitoring sites on agricultural and alpine land in Slovakia. All soil monitoring sites are located in WGS 84 coordinates. The monitoring site represents the circular shape, with a radius of 10 m and an area of 314 m². The most important risk elements concerning soil contamination are included (Cd, Cr, Pb, Ni, Zn, Cu, Se, Co extracted with aqua regia) and Hg (total content – using AMA analyzer).

Total content of the potential risk elements is one of the main parameter considered for soil sensitivity to the potential risk elements mobility. Distribution of soil contamination has been estimated as a surface contamination (Figure 1). Background levels of elements

in soils depend on both the nature of the parent materials and on the soil texture since many elements are associated with the fine particles which have the ability to adsorb or form solid solutions with the element of interest. For this reason the values of the limits of soil potential risk elements according to Slovak Soil Law depend on clay fraction.

CONCLUSION

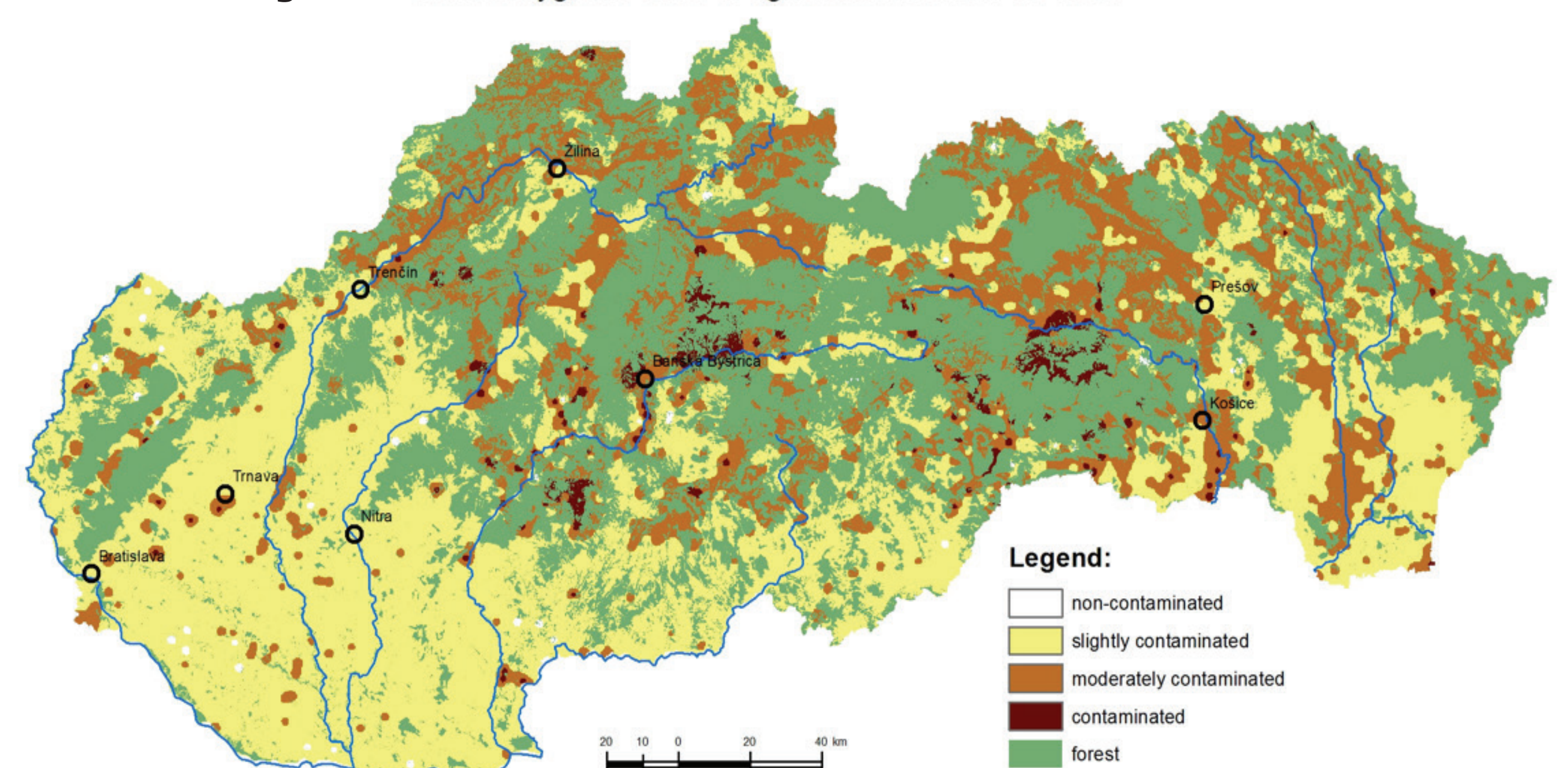
In general, on the basis of our results it may be said that the hygienic state of agricultural soils in Slovakia is good except of some contaminated sites which are mostly situated in the industrial areas (anthropogenic impact) and in the areas influenced by geogenic impact – occurrence of geochemical anomalies (mostly mountainous areas). The area of contaminated agricultural soils is less than 1% of total area of soils in Slovakia.

Tab. 1: Average content of risk elements (mg.kg⁻¹) extracted with aqua regia in agricultural soils (0 – 10 cm) in Slovakia

Soils	As	Cd	Co	Cr	Cu	Ni	Pb	Zn	Se	Hg ¹
FM	10.8	0.7	8.8	39.1	34.0	37.0	54.3	122.8	-	0.2
ČA	10.0	0.4	7.8	42.9	22.7	29.6	21.1	75.6	0.2	0.06
ČM	10.0	0.4	7.8	42.9	22.7	29.6	21.1	75.6	0.3	0.1
HM	9.2	0.2	10.0	41.5	22.9	32.6	19.7	68.8	0.1	0.05
LM+PG	9.9	0.3	9.7	42.8	17.0	23.3	24.2	66.7	0.2	0.07
KM	14.8	0.3	12.6	52.2	28.9	29.2	27.0	93.5	-	-
RM	3.4	0.1	2.0	19.5	17.0	12.0	7.7	41.0	0.3	0.03
RA	13.1	0.5	11.8	55.2	30.6	42.0	36.3	103.1	-	0.13

Explanations: FM – Haplic Fluvisols, ČA – Mollic Fluvisols, ČM – Chernozems, HM – Cutanic Luvisols, LM+PG – Albeluvisols and Planosols, KM – Cambisols, RM – Regosols, RA – Rendzic Leptosols, Hg¹ – total content (AMA analyzer)

Figure 1: Current hygienic state of agricultural soils in Slovakia



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