MINISTRY OF THE ENVIRONMENT OF THE SLOVAK REPUBLIC

STATE OF THE ENVIRONMENT REPORT

SLOVAK REPUBLIC 2005

The terms sustainable exploitation of the arable land and farming the farmland mean exploitation and protection of the properties and functions of the soil by the means and to the extent, which would keep its biological diversity, fertility, restoration ability and potential to perform all functions.

§ 2 letter e/ of the Act on Protection and Use of Farmland No. 220/2004 Coll., including the change of Act on Integrated Pollution Prevention and Control No. 245/2003 Coll., and on change and amendment of some laws

• SOIL

Land use

♦ Land Use on the basis of the Land Register's data

Total size of the Slovak Republic is 4 903 467 ha. In 2005, the share of agricultural land was 49.62 % of total land size, while the share of forestland was 40.89 %, and the share of non-agricultural and non-forest land was 9.48 %.

Land Use categories (state to the date 31st December 2005)

Land category	Area (ha)	% of total area
Agricultural land	2 432 979	49.62
Forest land	2 005 234	40.89
Water areas	93 381	1.91
Build-up land	226 257	4.61
Other land	145 616	2.97
Total area	4 903 467	100.00

Source: IGCC SR

♦ Changes to the landscape cover evaluated by comparing satellite images

Application of the CLC (Corine Land Cover) data layers from 1990 and 2000 showed changes in 1 612 km^2 of Slovakia's land cover. Major changes included:

in the area of forest and semi-nature land:

- change of 580.3 km^2 of forestland to woodland shrub,
- change of 529.7 km^2 of woodland shrub to forestland,
- 186 km^2 of agricultural grasslands, natural grasslands and heterogeneous agricultural areas have become woodland shrub,

in agricultural landscape:

- increase to the area of the mosaic pattern of fields, grasslands, and permanent cultures by 165.5 km^2, at the expense of the arable land especially (132.1 km^2),
- reduction of arable land by 56.9 km^2, beneficial to grasslands especially (46.2 km^2),
- changes of vineyards and orchards to arable land (49.6 km^2),

in urbanised landscape:

- increase in the area of residential, industrial, and recreational zones, as well as roads by 44.6 km^2 and water bodies with inflow canals by 64.2 km^2.

Soil properties

Information on state, trend in land properties and their degradation may be obtained from the Partial Monitoring System - Soil (PMS-S) carried out by the Soil Science and Conservation Research Institute.

♦ Chemical properties of soil

The following tables show changes to soil reaction values, volumes of acceptable phosphorus and potassium, and humus in the A-horizon of agricultural land over three PMS-S cycles.

Trend in soil reaction (pH/H_2O) in the A-horizon of soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles

Main soil unit	1993	1997	2002
Mollic Fluvisols AL	7.29	7.24	7.03
Fluvisols AL	7.13	6.95	-
Chernozems AL	7.28	7.31	-
Haplic Luvisols AL	6.71	6.85	-
Planosols AL	6.66	6.70	-
Planosols PG	6.31	6.24	-
Rendzic Leptosols AL	7.27	7.25	7.54
Rendzic Leptosols PG	7.17	7.18	6.57
Regosols AL	6.68	6.54	6.95
Cambisols AL	6.56	6.42	6.18
Cambisols PG	5.61	5.56	5.29
Solonchaks and Solonetz PG	8.29	7.88	8.45
Podzols PG	4.21	3.93	3.88

AL – Arable Land, PG – Permanent Grassland Source: SSCRI

Trend in the amount of acceptable P in the A-horizon of soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles ($mg.kg^{-1}$)

Main soil unit	1993	1997	2002
Mollic Fluvisols	101.50	94.40	61.70
Andosols	44.62	58.25	57.22
Regosols	145.76	77.30	140.94
Rendzic Leptosols	95.60	62.80	64.94
Eutric Cambisols	48.78	66.10	30.62
Dystric Cambisols	106.50	98.90	47.50
Solonchaks and Solonetz	39.20	32.30	22.32
Podzols	46.12	27.30	25.11

Source: SSCRI

Trend in the amount of acceptable K in the A-horizon of soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles (mg.kg^{-1})

Main soil unit	1993	1997	2002
Mollic Fluvisols	251.20	198.40	238.45
Andosols	153.00	109.00	101.00
Regosols	232.75	103.60	155.13
Rendzic Leptosols	240.00	152.40	188.16
Eutric Cambisols	193.75	211.60	173.14
Dystric Cambisols	212.37	118.50	175.13
Solonchaks and Solonetz	179.66	105.30	116.52
Podzols	144.33	103.10	101.65

Source: SSCRI

Trend in the amount of humus in the A-horizon of soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles (%)

Main soil unit	1993	1997	2002
Chernozems AL	2.74	2.17	-
Mollic Fluvisols AL	3.69	3.14	3.74
Fluvisols AL	2.72	2.26	-
Haplic Luvisols AL	2.07	1.71	-
Planosols and Luvisols AL	2.07	1.69	-
Planosols and Luvisols PG	3.85	3.47	-
Cambisols on vulcanite PG	5.00	3.62	5.69
Cambisols on vulcanite AL	3.65	3.17	4.52
Stagni-Cambisols PG	4.55	3.52	4.98
Stagni-Cambisols AL	2.86	2.26	3.17
Cambisols on acid substrates and slates PG	6.17	4.72	6.76
Cambisols on acid substrates and slates AL	3.09	2.41	3.71
Cambisols on carbonates substrates PG	6.47	5.00	6.72
Cambisols on carbonates substrates AL	2.98	2.52	3.40
Cambisols PG	5.55	4.22	6.04
Cambisols AL	3.15	2.59	3.70
Regosols AL	1.76	1.57	2.05
Podzols, Sceletic Leptosols, Leptosols PG	18.79	20.00	24.79
Solonchaks and Solonetz PG	2.40	2.02	2.83
Rendzic Leptosols AL	3.05	2.62	2.76
Rendzic Leptosols PG	6.03	5.34	7.59

AL – Arable Land, PG – Permanent Grassland

Source: SSCRI

♦ **Physical properties of soil**

The table shows changes to values of total porosity in the A-horizon of agricultural land during three PMS-S cycles.

Trend in overall porosity in the A-horizon of soil in Slovakia, based on the comparison of outcomes from three PMS-S cycles

Main soil unit	Volume %								
	Light soils			Medium heavy soils			Heavy soils		
	1993	1997	2002	1993	1997	2002	1993	1997	2002
Mollic Fluvisols	-	-	-	46.42	49.52	49.79	53.45	48.8	48.57
Rendzic Leptosols	-	-	-	53.71	41.76	46.79	46.66	50.29	55.55
Regosols	44.64	44.31	45.90	-	-	-	-	-	-
Cambisols	32.70	45.50	-	40.20	48.30	50.92	51.90	51.60	53.24

Source: SSCRI

Soil degradation

Soil contamination by heavy metals

Results from the III. cycle of PMS-S with samples extracted in 2002 showed that the content of the majority of risk substances in selected agricultural land of Slovakia are below the limit, especially being the case of arsenic, chromium, copper, nickel, and zinc. In case of cadmium, excessive limit values were recorded only in soils situated in higher altitudes, podzols, andosols, which might relate to remote transfer of emissions (Kobza and coll., 2002).

Most recent average distribution of risk elements ($mg.kg^{-1}$) in the A-horizon of some agricultural land types in Slovakia (III. monitoring cycle of PMS-S)

Main soil unit	Risk elements in 2 $ml.dm^{-3}$ of HNO_3 leachate						
	As	Cd	Cr	Cu	Ni	Pb	Zn
Podzols and Sceletic Leptosols	3.55	0.48	2.24	4.52	0.85	63.61	12.94
Andosols	1.42	0.51	3.32	11.00	1.01	49.72	33.44
Regosols	0.65	0.17	3.31	8.38	1.84	5.31	9.34
Solonchaks and Solonetz	1.03	0.20	4.24	5.84	4.33	11.71	9.49
Cambisols	1.89	0.25	3.08	10.20	3.07	18.88	11.92
Rendzic Leptosols	0.69	0.38	3.50	9.10	5.15	20.40	21.55
Mollic Fluvisols	1.45	0.22	3.55	13.05	5.95	16.10	15.55

Source: SSCRI

In the III. monitoring cycle covering 274 agricultural hunts with the size of 15 802 ha, no excessive limit pollutants (PAU, PCB, chlorinated hydrocarbons) were found in the monitored hunts.

♦ Physical degradation

Erosion and soil compaction belong among the major phenomena of physical degradation in Slovakia.

Soil erosion

Water erosion is prevalent in Slovakia.

Agricultural land endangered by erosion in the SR

Erosion categories	Water erosion		Wind erosion	
	Land area in ha	% from Agricultural Land	Land area in ha	% from Agricultural Land
No erosion or slightly	1 274 857	52.3	2 286 822	93.8
Medium	217 487	9.0	73 186	3.0
Strong	368 704	15.1	45 753	1.9
Extremely strong	575 831	23.6	31 118	1.3
Total	2 436 879	100.0	2 436 879	100.0

Source: SSCRI

Application of the sewage sludge and bottom sediments into the soil

From the available data in 2005, production of sludge in that year resulted in 56 360 tons of dry matter. Of this volume, 39 120 tons (64.4 %) were used, and 8 710 tons (15.5 %) were landfilled, 5 870 tons of sludge dry matter were directly applied into agricultural land, 28 910 tons of sludge dry matter was used for compost production, while 4 340 tons of sludge was used for land purposes through different ways (recultivation, etc.).

Sewage sludge application into the soil

Year	Amount of sewage sludge (t)	Content (mg/kg dry matter)						
		Cd	Cr	Cu	Hg	Ni	Pb	Zn
2003	17 245	2.53	85.7	284	5.20	52.6	131.0	1 460
2004	12 067	1.84	115.0	276	3.12	23.9	72.6	1 130
2005	5 870	2.01	74.3	218	2.80	26.3	58.1	1 235

Source: WRI