

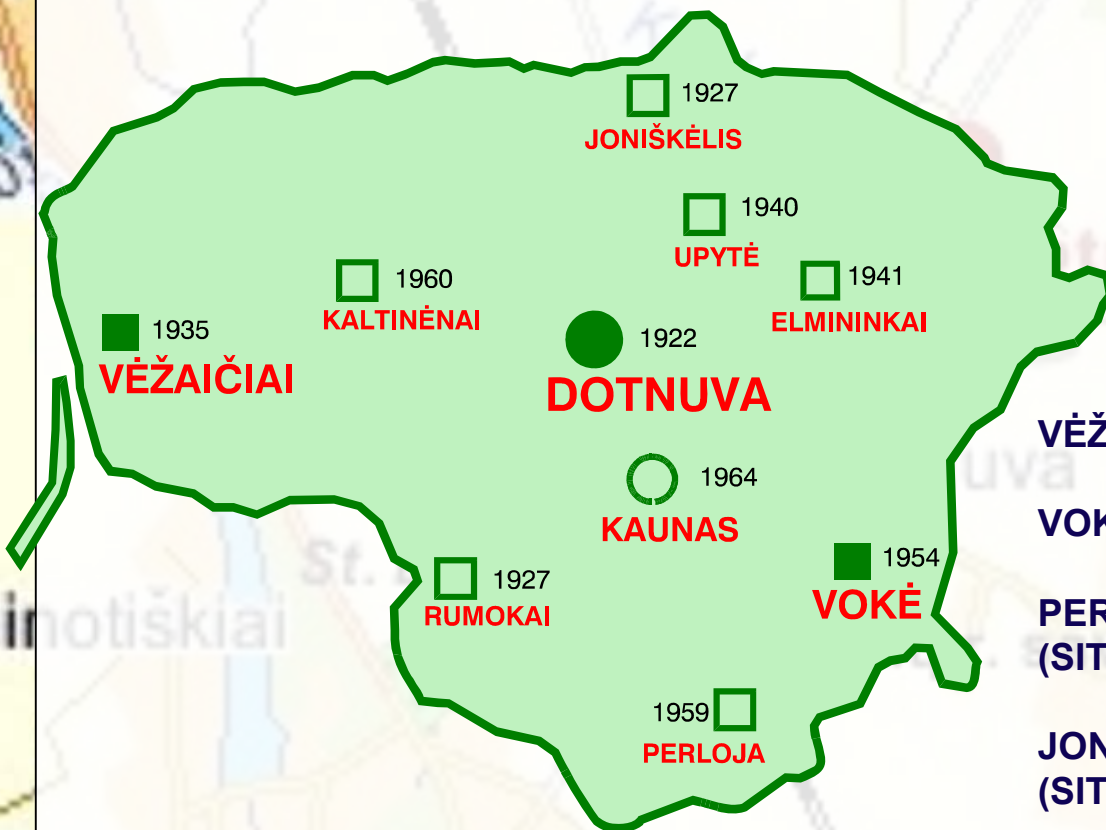
Assessing trace elements accumulation/depletion in agricultural Lithuanian soils

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VĖŽAIČIAI BRANCH (SITES V1-V4)

VOKĖ BRANCH (SITES V5-V7)

**PERLOJA RESEARCH STATION
(SITE P10)**

**JONIŠKĖLIS RESEARCH STATION
(SITE J11)**

DOTNUVA (SITE D12)

Methods

In each trial, arable layer samples were taken from the control (CB) and anthropogenic (more intensively fertilized, limed depending on a trial scheme) treatments (AI) of each (3 to 5) replication. The size of treatment plots in separate trials varied from 30 m² to 112 m².

- Samples analyzed by AAS method and directly analyzed with X-rays upon fine grinding (for Sr).

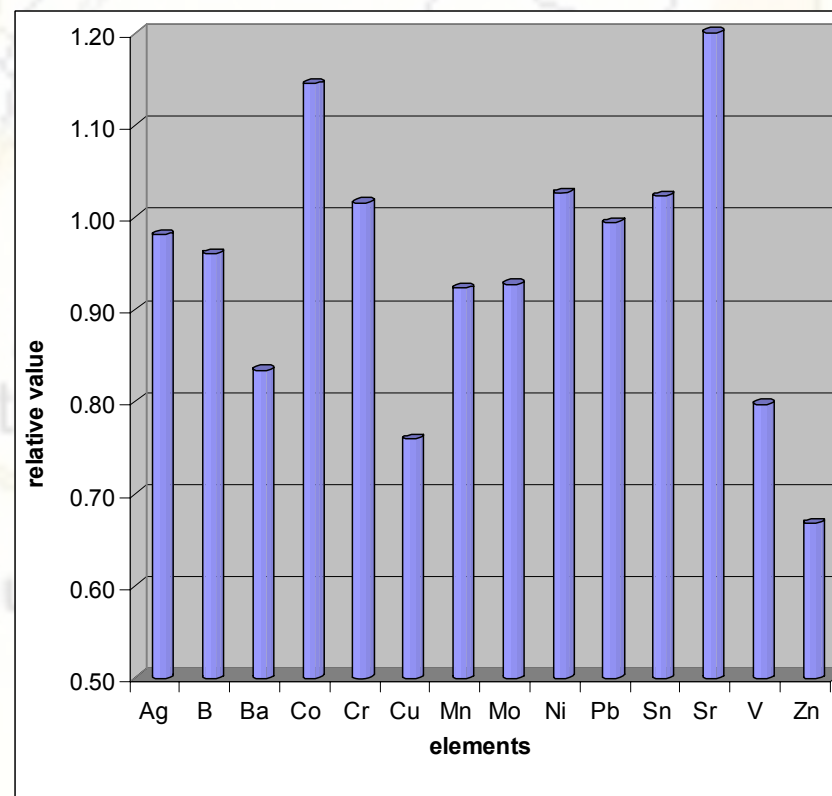
West Lithuania

- Here, the pedogenic rocks comprise mostly light and medium sandy loam.
- Climatic conditions in the zone favour the processes of soil leaching and podzolization.
- In the current study, the zone is represented by four field trials, all in Vezaiciai location of Klaipeda Region (West Žemaičiai plateau).
- The trial soils are typical of the zone and are albeluvisols



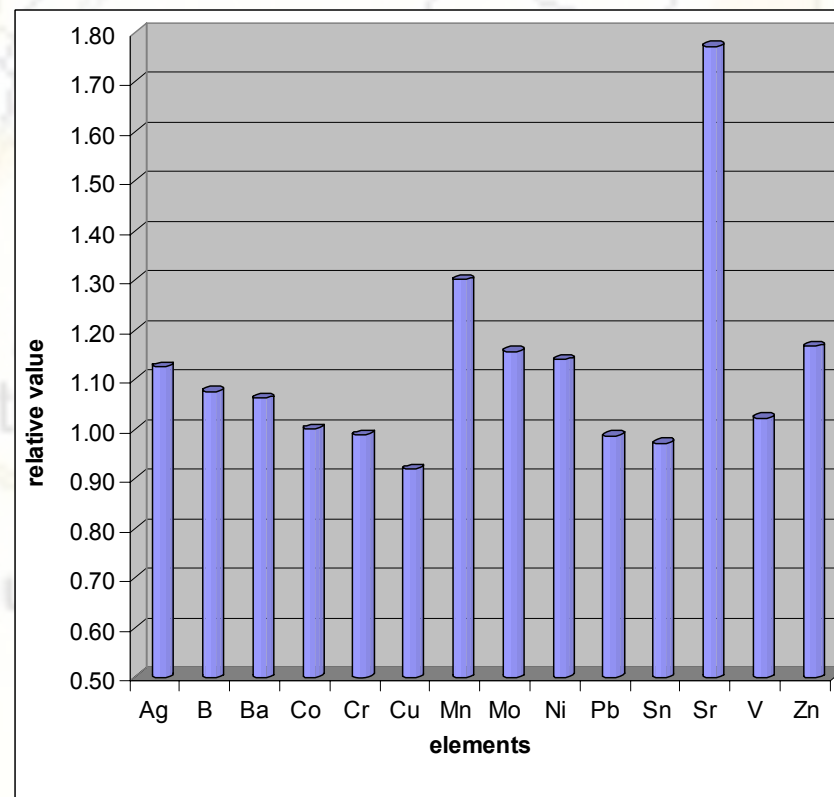
Site code`	Soil	Treatments description and inputs
V1	Dystric Albeluvisol (ABd)	CB. Unlimed and unfertilised; AI. Slacked lime (single application of 6,6 tha⁻¹ CaCO₃ in 1948 y.) with annual NPK fertilizing.

	CB	AI	% of PC
Ag	0,104	0,102	5,1
B	35,2	33,8	67,6
Ba	482	402	67,0
Co	6,64	7,6	25,3
Cr	51,6	52,4	52,4
Cu	10,8	8,2	8,2
Mn	1166	1076	71,7
Mo	0,82	0,76	15,2
Ni	19,1	19,6	26,1
Pb	16,7	16,6	16,6
Sn	2,60	2,66	26,6
Sr	75	90	
V	61,6	49,1	32,7
Zn	51,2	34,2	11,4



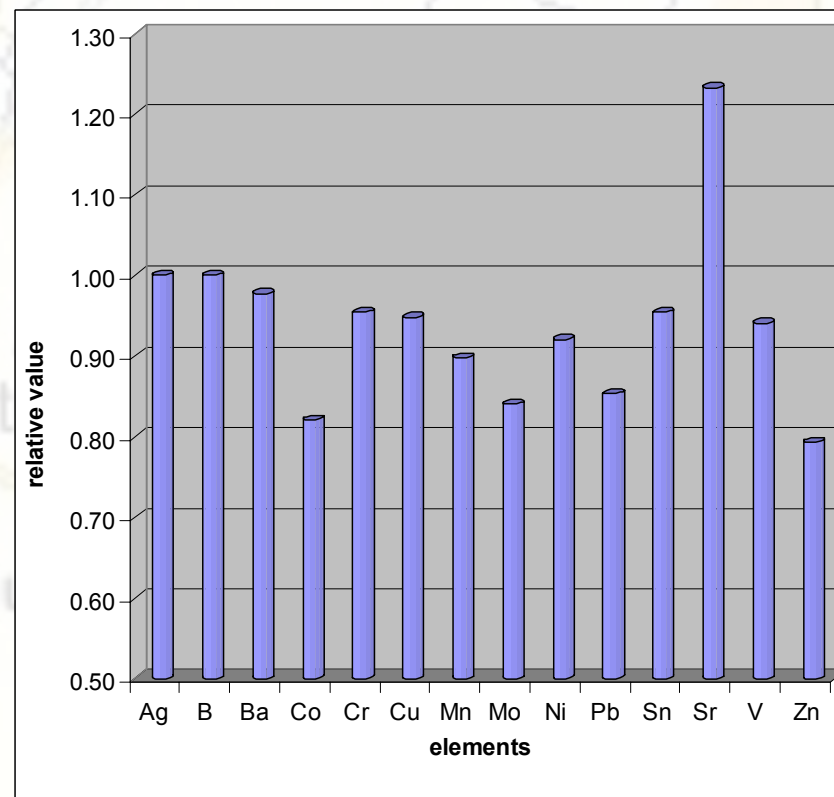
Site code`	Soil	Treatments description and inputs
V2	Dystric Albeluvisol (ABd)	CB. Unlimed and unfertilised; AI. Liming with manuring (120 t ha⁻¹ manure every 7 year from 1959 m. applied twice in rotation 60 t ha⁻¹) and annual NPK fertilizing.

	CB	AI	% of PC
Ag	0,08	0,09	4,5
B	31,8	34,2	68,4
Ba	456	484	80,7
Co	6,4	6,4	21,3
Cr	49,2	48,6	48,6
Cu	12,4	11,4	11,4
Mn	832	1082	72,1
Mo	0,64	0,74	14,8
Ni	17,2	19,6	26,1
Pb	14,4	14,2	14,2
Sn	2,70	2,62	26,2
Sr	57,6	102,0	
V	55,2	56,4	37,6
Zn	41,0	47,8	15,9



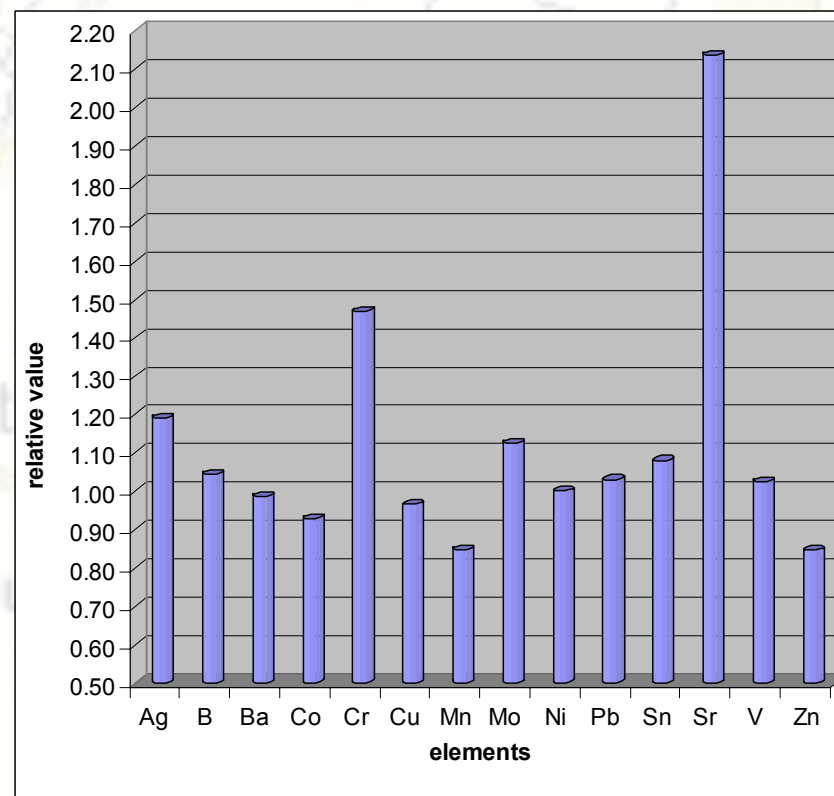
Site code`	Soil	Treatments description and inputs
V3	Dystric Albeluvisol (ABd)	CB. Unlimed and unfertilised; AI. Liming (every 7 year from 1949 m.) with annual NPK fertilizing.

	CB	AI	% of PC
Ag	0,09	0,09	4,5
B	33	33	66,0
Ba	345	337	56,2
Co	7,8	6,4	21,3
Cr	54,5	52	52,0
Cu	9,5	9	9,0
Mn	925	830	55,3
Mo	0,75	0,63	12,6
Ni	18,8	17,3	23,1
Pb	17	14,5	14,5
Sn	2,83	2,7	27,0
Sr	107,5	132,5	
V	58,5	55,0	36,7
Zn	41,0	32,5	10,8



Site code`	Soil	Treatments description and inputs
V4	Dystric Albeluvisol (ABd)	CB. Unlimed and unfertilised; AI. Liming with manuring (120 t ha ⁻¹ manure every 7 year from 1959 m. applied twice in rotation 60 t ha ⁻¹) and annual NPK fertilizing.

	CB	AI	% of PC
Ag	0,1	0,119	6,0
B	32,3	33,7	67,4
Ba	466,7	460	76,7
Co	6,33	5,87	19,6
Cr	33,57	49,3	49,3
Cu	11,7	11,3	11,3
Mn	1020	863	57,6
Mo	0,8	0,9	18,0
Ni	17,3	17,3	23,1
Pb	17,2	17,7	17,7
Sn	2,53	2,73	27,3
Sr	64,0	136,7	
V	52,7	54,0	36,0
Zn	50,0	42,3	14,1



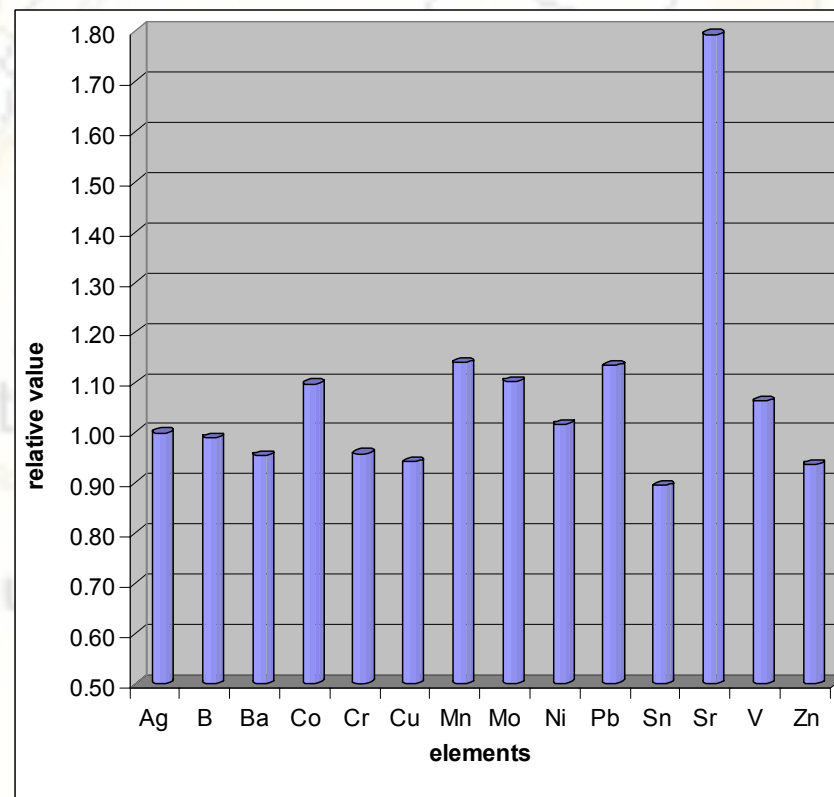
East Lithuania

- The East Lithuanian soil zone is most remote from the sea, and the climate is continental here.
- In the East Lithuanian sandy soil region the pedogenic rocks are fluvioglacial sands. In the region common sandy soils prevailing; the agronomic value of soils is very low.
- The zone is represented by four field trials in Dainava Plain, Vokė and Perloja trial plots (sites V5–V9). The trial soils were luvisols.



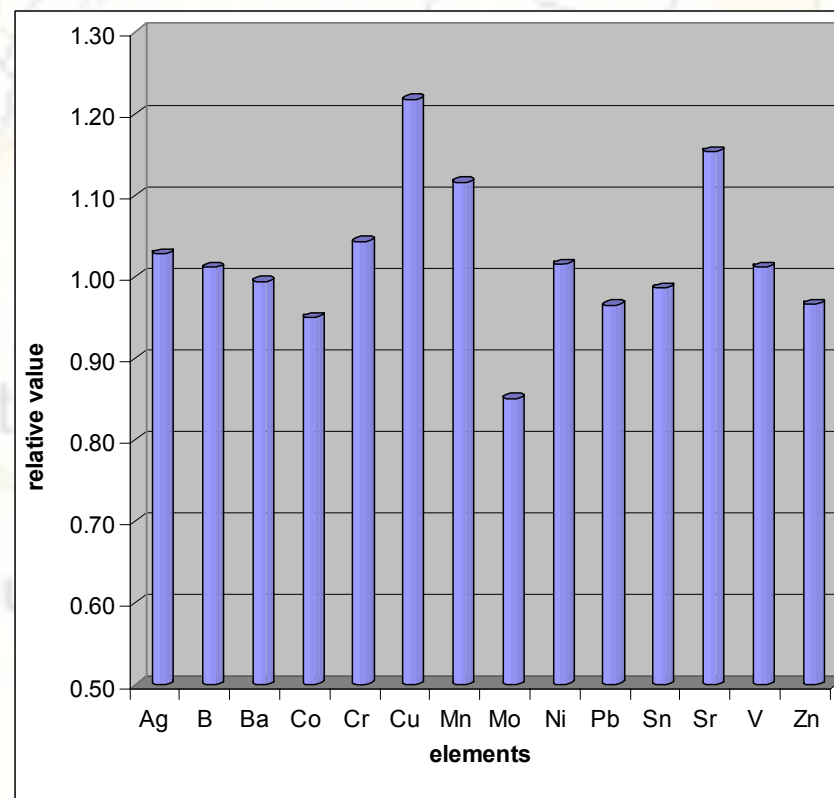
Site code`	Soil	Treatments description and inputs
V5	Haplic Luvisol (LVh)	CB. Unlimed and unfertilised; AI. Calcareous sapropel (200 t ha⁻¹ single application in 1984 y.) with annual NPK fertilizing

	CB	AI	% of PC
Ag	0,076	0,076	3,8
B	28,8	28,5	57,0
Ba	327,5	312,5	52,1
Co	5,2	5,7	19,0
Cr	40,5	38,8	38,8
Cu	8,5	8	8,0
Mn	610	695	46,3
Mo	0,59	0,65	13,0
Ni	12,3	12,5	16,7
Pb	13,5	15,3	15,3
Sn	2,83	2,53	25,3
Sr	72,5	130,0	
V	37,0	39,3	26,2
Zn	11,0	10,3	3,4



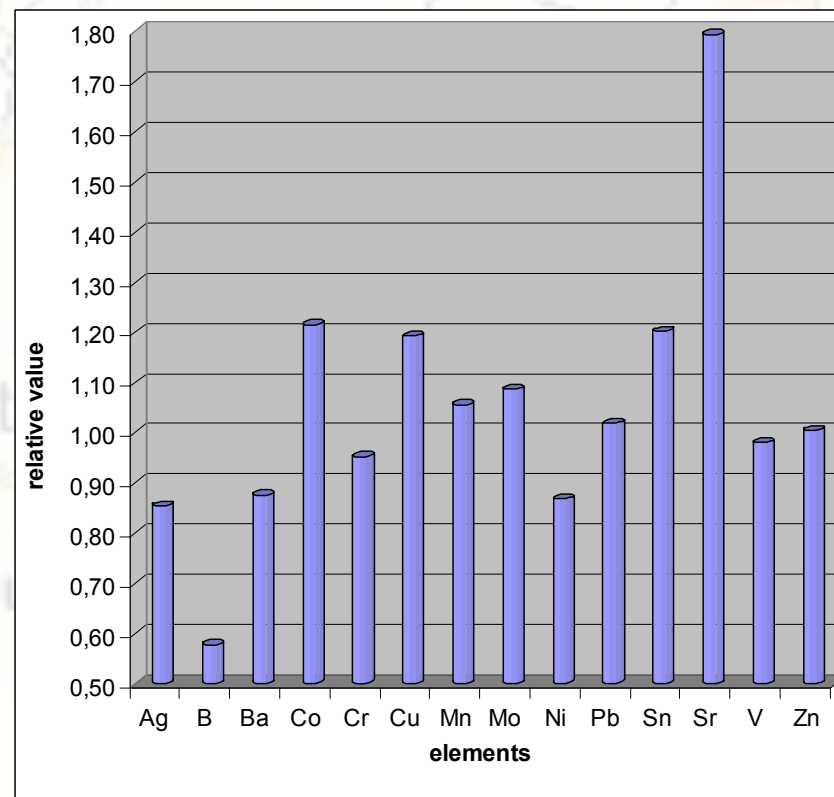
Site code`	Soil	Treatments description and inputs
V6	Haplic Luvisol (LVh)	CB. Unlimed and unfertilised; AI. Dust limestone (single application of 7,18 t ha⁻¹ CaCO₃ in 1972 y.) with annual NPK fertilizing.

	CB	AI	% of PC
Ag	0,071	0,073	3,7
B	26,5	26,8	53,6
Ba	387	385	64,2
Co	4	3,8	12,7
Cr	39,3	41	41,0
Cu	7,8	9,5	9,5
Mn	600	670	44,7
Mo	0,47	0,4	8,0
Ni	12,9	13,1	17,5
Pb	14,5	14	14,0
Sn	2,23	2,2	22,0
Sr	65,0	75,0	
V	41,8	42,3	28,2
Zn	23,8	23,0	7,7



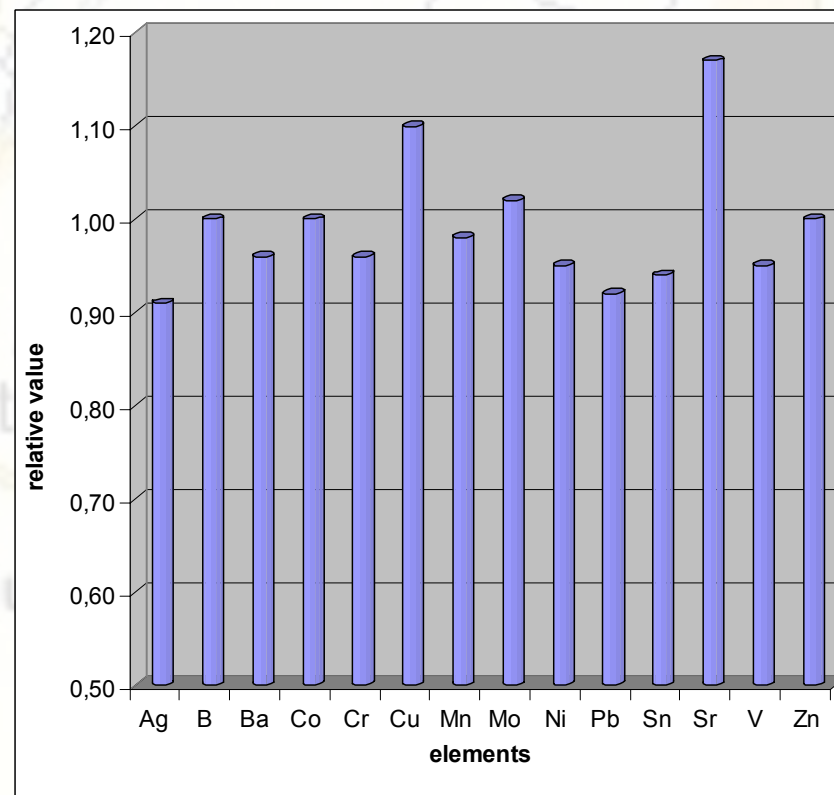
Site code`	Soil	Treatments description and inputs
V7	Haplic Luvisol (LVh)	CB. Unlimed and unfertilised; AI. Liming (periodical, 24,64 t ha⁻¹ CaCO₃ applied since 1973 y.) with annual NPK fertilizing.

	CB	AI	% of PC
Ag	0,082	0,07	3,5
B	26,5	15,3	30,6
Ba	497	435	72,5
Co	4,2	5,1	17,0
Cr	42	40	40,0
Cu	7,8	9,3	9,3
Mn	580	612	40,8
Mo	0,58	0,63	12,6
Ni	13,6	11,8	15,7
Pb	13,75	14	14,0
Sn	1,98	2,38	23,8
Sr	72,5	130,0	
V	39,3	38,5	25,7
Zn	17,5	17,6	5,9



Site code`	Soil	Treatments description and inputs
P8	Haplic Luvisol (LVh)	CB. Unfertilized AI. Organic and annual NPK mineral fertilizing (80 t ha⁻¹ manure every 5th year since 1960 y.)

	CB	AI	% of PC
Ag	0,08	0,073	3,7
B	27,75	27,75	55,5
Ba	422,5	407,5	67,9
Co	4,05	4,05	13,5
Cr	42,7	41	41,0
Cu	7	7,7	7,7
Mn	655	640	42,7
Mo	0,53	0,54	10,8
Ni	11,75	11,15	14,9
Pb	13,25	12,25	12,3
Sn	2,38	2,23	22,3
Sr	66,5	77,5	
V	38,8	37,0	24,7
Zn	26,5	26,5	8,8



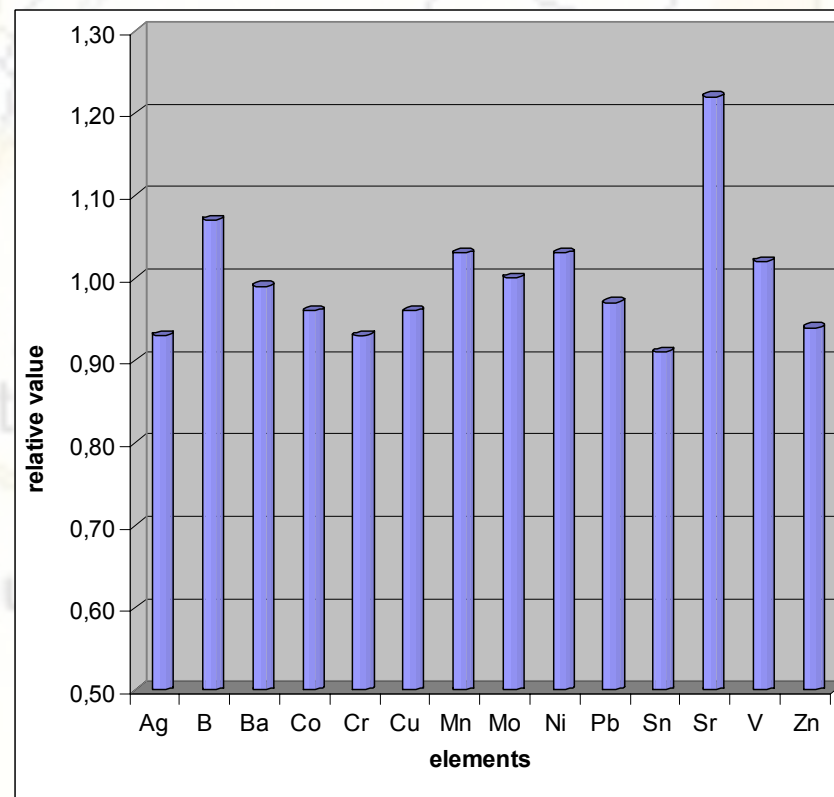
Middle Lithuania Lowland

- The Middle Lithuanian soil zone covers central part of Lithuania.
- In the Middle Lithuanian region the pedogenic rocks are calcareous, characterised by plain landscape.
- The zone is represented by two field trials in Musos – Nemunelio Plain, Joniskelis trial and Dotnuva. The trial soils were cambisols - typical in region.



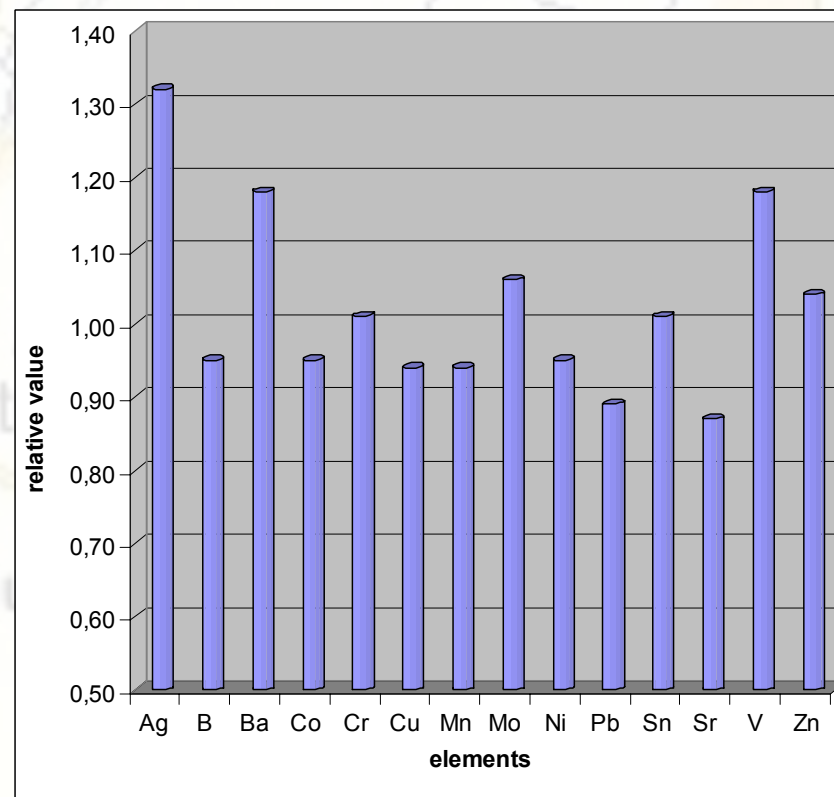
Site code`	Soil	Treatments description and inputs
J9	Stagnic luvisol (LVj)	CB. Unfertilized AI. Organic and annual NPK mineral fertilizing (80 t ha⁻¹ manure every 5th year since 1960 y.)

	CB	AI	% of PC
Ag	0,069	0,064	3,2
B	48,8	52	104,0
Ba	590	585	97,5
Co	7,88	7,6	25,3
Cr	61,5	57	57,0
Cu	17,5	16,8	16,8
Mn	437,5	452,5	30,2
Mo	0,85	0,85	17,0
Ni	25,8	26,5	35,3
Pb	12,8	12,38	12,4
Sn	3,43	3,13	31,3
Sr	84,0	102,5	
V	77,0	78,5	52,3
Zn	70,5	66,0	22,0



Site code`	Soil	Treatments description and inputs
D10	Gleyic Cambisol (CMg)	CB. Unfertilized AI. Mineral NPK fertilizing (but P240K360 only every 4th year since 1971 y.)

	CB	AI	% of PC
Ag	0,079	0,104	5,2
B	36,8	34,8	69,6
Ba	410	485	80,8
Co	7,45	7,1	23,7
Cr	50	50,3	50,3
Cu	8,3	7,8	7,8
Mn	375	352,5	23,5
Mo	0,53	0,56	11,2
Ni	20,3	19,3	25,7
Pb	17,3	15,4	15,4
Sn	2,65	2,68	26,8
Sr	77,5	67,5	
V	54,0	63,5	42,3
Zn	30,5	31,8	10,6



West Lithuania

L+MF

L+MF+OF

L+MF

L+MF

-Ba

-Cu

-Zn

+B

+Ni

+Sr

+Zn

-Co

+Sr

East Lithuania

S+MF

L+MF

L+MF

MF+OF

+Sr

+Cu

+Co

+Sr

Middle Lithuania

MF+OF

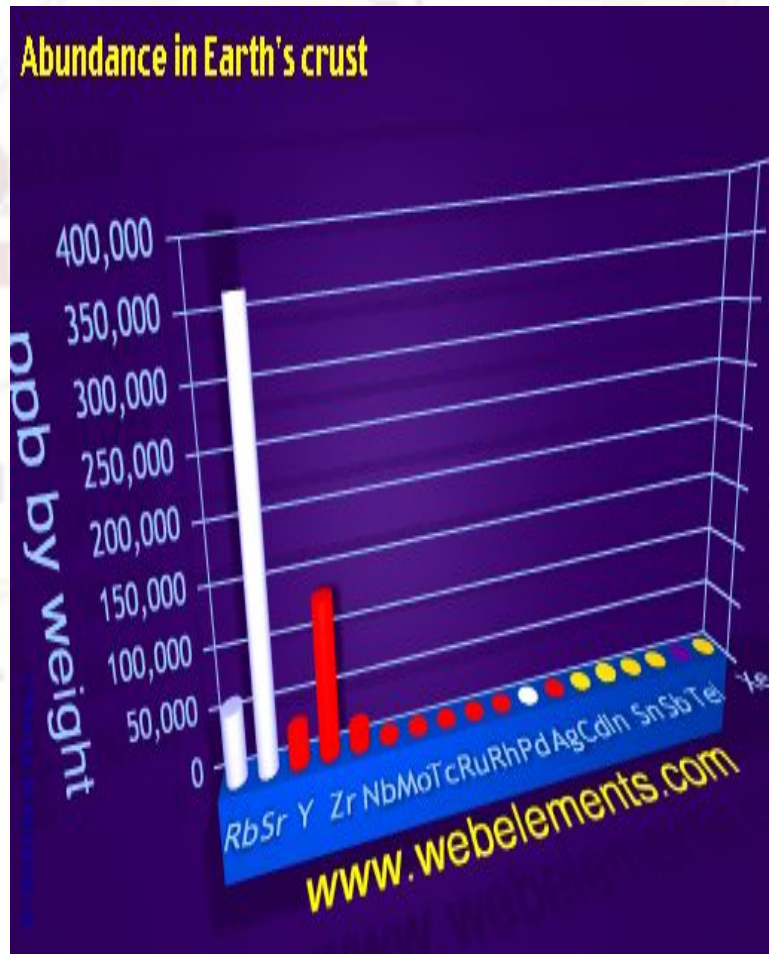
MF

Studies conducted in the world proved that **SAPROPEL**:

acts as a radio protector, i.e. promotes maintenance of radioactive strontium and other heavy metals in soil in an inert form, unavailable for plants.

Sr accumulation

- This element gets into soil as a constituent part of fertilizers (dolomite, potassium, nitrogen of phosphate substances), or its content undergoes changes caused by the altered Sr uptake.
- The levels of Sr higher in periodically limed and fertilized arable soil (site V2) and showed a direct dependence on fertilization intensity (site V4). This element in the arable soil layer becomes immobilized at higher Ca levels and lowered soil acidity (at pH increased). When the soil regains its natural acidity, Sr levels show no reliable changes (site V1).



Thank you for attention

