Survey Of Regulated And Non-Regulated Metals In A Range Of Ontario Agricultural Soils

Purpose:

To determine the concentrations of regulated & non-regulated metals in a range of agricultural soils across Ontario. Furthermore, the results will be used to evaluate if the concentrations of metals in agricultural soils across Ontario have any potential to pose a risk in the use of biosolids as a nutrient source. (A parallel project administered by MOE measured the concentration of the same metals in municipal sewage biosolids)

Methods:

Multiple fifteen centimeter (6 inch) cores were extracted from 178 row crop and horticultural crop fields in the fall of 2002 in conjunction with the ongoing Benchmarking N and N Verification studies conducted by OMAF Crop Technology staff. A minimum of 32 cores or 24 cores were extracted from Benchmark and Verification sites respectively. The cores were composited to 400 grams of a well mixed sample. Duplicate samples were packaged and forwarded to the Land Resource Dept. of the University of Guelph and the Ontario Ministry of Environment for metal concentration analysis.

Results:

Table 1. presents the metals data summarized over the range of farm types evaluated. Data is presented to show metals levels in overall sites and broken out by row crop and hort crop related sites.

Summary:

The concentrations of the regulated metals were with few exceptions, lower than the maximum permissible levels as stated in the *Guidelines for the Utilization of Sewage Biosolids and Other Wastes, March 96.*

Next Steps:

The data will be further scrutinized to determine if any of the unregulated metal concentrations found pose any potential negative impacts regarding the utilization of municipal biosolids or other regulated materials as nutrient sources or soil amendments.

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Table1: Concentration of Regulated and Non Regulated Metals in Ontario Farm Fields Compared to the Ontario Typical Range for Metals Based on MOE Standards

Site Types	Chloride	Mercury	Beryllium	Magnesium	Aluminum	Calcium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
1*	23.32	0.07	1.1	10000	29000	23000	62	45.1	984	35100	17.1	37.4
2	2.8	0.02	0.5	4850	15000	6800	39	23	570	20000	7.7	17
3	232.6	0.12	0.56	11040	26260	61920	53.3	40.3	870	27780	14	37.5
4	3.6	0.02	0.25	2900	8950	5450	27	14	320	13500	4.6	13
5	45	0.13	1.1	20000	30000	55000	77	58	2200	35000	16	38

Site Types	Copper	Zinc	Molybdenum	Cadmium	Barium	Lead	Strontium	Boron	Silver	Sodium	Total Potassium	Sulphur
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
1	33	120	3.04	1.1	197	22	56.8	28	0.2	505	5870	0.05
2	14	63	0.25	0.45	71.5	10	20	9.7	0.075	120	2000	0.026
3	309	142.6	7.07	1.03	181.2	31.9	97.1	34.5	0.11	290	4912	0.34
4	16	56	0.25	0.25	43	11	17	9.2	0.05	95	1300	0.03
5	41	120	1	0.71	160	45	64	30	0.27	660	6500	0.079

Site Types	Total Nitrogen	Total Phosphorus	Total Solids	Uranium	Arsenic	Selenium	Antimony	Fluoride	Titanium	Tin	Thallium	
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	% dry wt	ug/g	ug/g	
1	3.1	1.6	91.7	3.04	9.79	0.57	0.8	187	0.567	1.37	0.89	
2	1.8	0.92	50	0.65	3.5	0.2	0.2	57	0.42	0.61	0.29	
3	30.3	2.9	825.2	4.61	15.52	1.63	0.619	474	0.53	9.02	10.66	
4	1.6	1	42	0.8	4.15	0.18	0.1	78	0.33	0.96	0.598	
5	5.7	1.9	na	2.1	11	0.93	0.43	61	0.52	na	0.81	

1*	This value is the 98th percentile value from 134 Field Crop Sites from across Southern Ontario.
2	This value is the median value from 134 Field Crop Sites from across Southern Ontario.
3	This is the 98th percentile value from 44 Horticultural Field sites from across Southern Ontario.
4	This is the median value from 44 Horticultural Field sites from across Southern Ontario.
5	The Ontario Typical Range is the average value for Rural Parkland (parks, cemeteries, forests, woodlots and other undeveloped areas) as determined by a MOE survey published in 1993 (ISBN O-778-1979-1).

The 98th percentile values presented in Site Types 1 and 3 are the points where 98% of the samples have values lower than this value, and 2% have values higher...in other words, it represents the highest values you are likely to find in the data set.