

# Ashes for organic farming in Finland

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## The aim

- of our work was to ensure the quality of ash fertilizers and compare the differences between ash products.
- is to increase organically arable land to 20% by the year 2020.

## Introduction

Regulation (EC) No 2003/2003 of the European Parliament and of the Council relating to fertilizers deals with the production, trade and use of inorganic fertilizers in the EU area and the import and export of these products and their raw materials. The National Act on Fertilizer Products 539/2006 and the Decree of the Ministry of Agriculture and Forestry on Fertilizer Products 24/11 regulates the requirements for the type designation list and the requirements for quality, marking, packaging, transporting, storage, usage and other requirements and the raw materials used in fertilizer products.

Cadmium content in Finnish topsoil is low (Fig. 1). Many ash products in which toxic metals are below allowed maximum limits, are suitable for organic farming in Finland. It is forbidden to use peat ashes, since it is a non-renewable raw material.

Evira's registry "Fertilizers and soil conditioners suitable in organic production" contains ash products from only four manufacturers (Terho Hukka, Vapo-Timber Oy, Iisalmen sahat Oy and IPOWood). To promote organic farming in Finland we should inform and encourage manufactures to register more.

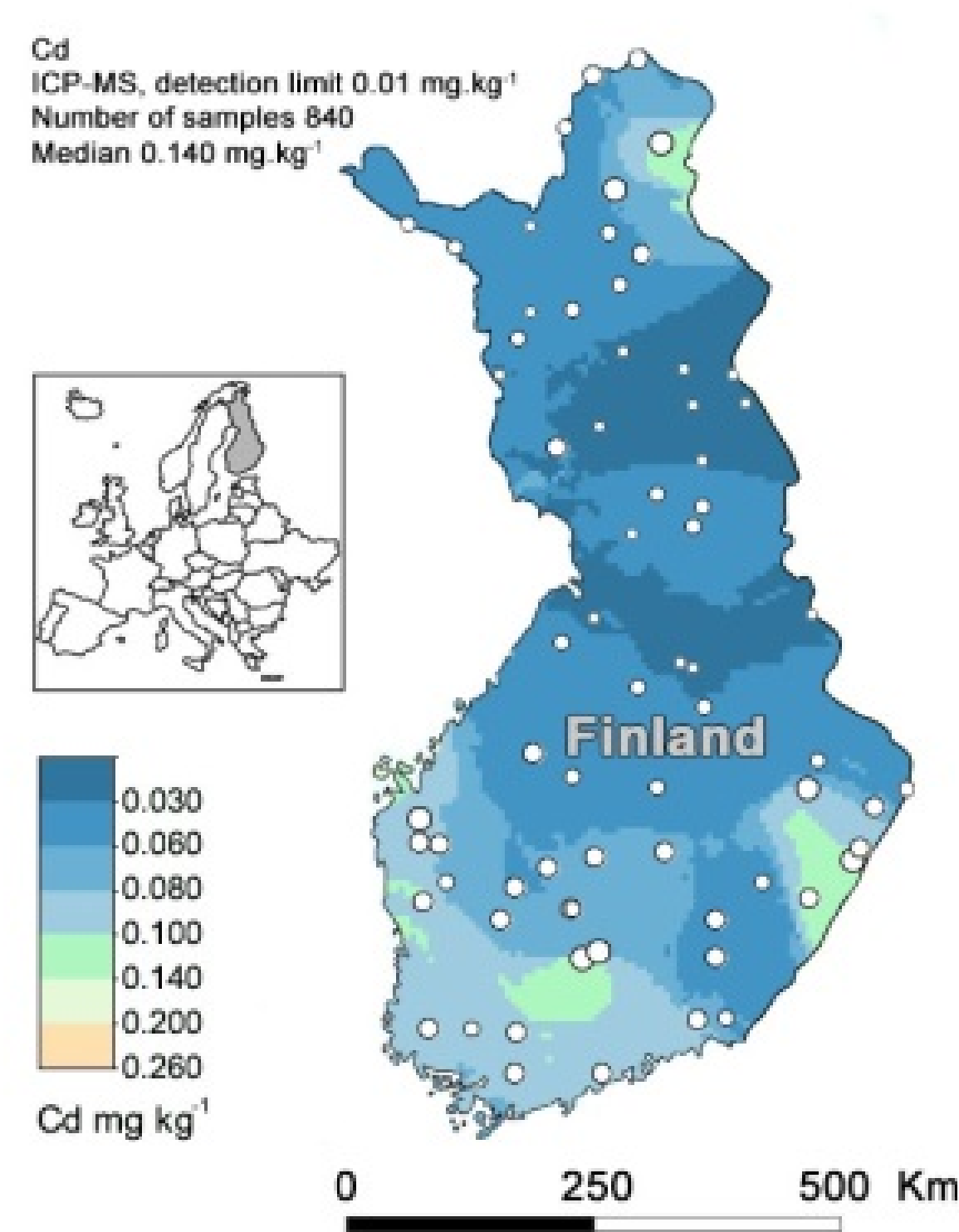


Fig. 1. Cadmium content in Finnish topsoil

## Material & Methods

Evira controls ash products from power plants. Since the year 2007 ash samples which were qualified to field fertilization included also samples which would have qualify to organic farming (Fig. 2). ICP-MS and ICP-OES-techniques and microwave dissolution with nitric acid and hydrogen peroxide were used to analyse 13 elements from ash (wood, peat, plants) fertilizers (Fig. 3). We used Evira's ICP-MS method 8129, Evira's ICP-OES method 8107, AMA254 Mercury Analyzer, Evira's AAS methods (years 2007 - 2010) and EPA's method 3050B, 3051A. Neutralizing value was analyzed according to SFS-EN 12945. Evira's Chemistry and Toxicology laboratory is accredited according to ISO 17025.



Fig. 2 Ash samples



Fig. 3 ICP-MS spectrometer

## Results & discussion

In the years 2007 - 2013 the suitability of ash for use as fertilizers and the quality and the reuse applications of ash were investigated (Tab. 1). We have analyzed toxic metals in the ash samples as well. We proved that 21 ash samples were reliable for fertilization of fields, 33 ash samples were suited only for fertilization of forests and 12 ash samples were forbidden from use as a fertilizer due to high levels of toxic metals. Also nutrients and neutralizing values were analyzed. Figure shows cadmium levels in ashes suited for field fertilization (Fig. 4). The National legislation in Finland prohibit the use of ash fertilizers in fields with the limit value of Cd > 2,5 mg/kg dry matter. Above this level (2,6 – 5 mg/kg dry matter) cadmium is forbidden for field fertilization. Our samples included products registered as ashes for organic farming as well as other ash fertilizers used for conventional agriculture.

## Conclusion

Nowadays only eight percent of cultivated field area is used for organic farming. The demand of fertilizer products for organic farming is strongly increasing. The ash fertilizer contains many valuable nutrients in fairly optimal ratios. The price of ash as a fertilizer and a liming material is good. More ash fertilizers could be qualified to organic farming in the near future.

Tab. 1. Trace metals in ashes for organic farming in the years 2007-2013

Ashes	Arsenic	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc
<b>Allowed Maximum value</b>	25	1,0	2,5	300	600	100	100	1500
	mg/kg dm.	mg/kg dm.	mg/kg dm.	mg/kg dm.	mg/kg dm.	mg/kg dm.	mg/kg dm.	mg/kg dm.
Prod. 1	<0,5	<0,01	1.6	28	87	26	12	348
Prod. 2	3.5	0.07	4.9	41	100	17	20	666
Prod. 3	0.5		1.9		50	16	9.3	
Prod. 4	<1,0	<0,01	2	24	99	22	13	340
Prod. 5	<0,1	<0,01	2.6	13	60	21	8.2	1000
Prod. 6	2.3	0.01	3.8	27	250	42	20	730
Prod. 7	<1,0	<0,01	2	24	99	22	13	340
Prod. 8	2.3	0.01	3.8	27	250	42	20	730
Prod. 9	3	<0,01	3.6	320	140	21	35	780
Prod. 10	15		21	22	150	23	95	5500
Prod. 11	23	0.26	9		210	70	120	1700
Prod. 12	1.7	0.01	3.9	24	59	39	5.3	1100
Prod. 13	4.1		5.8	74	170	51	31	1900
Prod. 14	2.9		25	18	95	29	33	2200
Prod. 15	65		3	98	380	59	49	590
Prod. 16	17		2	180	260	66	50	550
Prod. 17	57		0.75	200	790	44	77	1200
Prod. 18	3.1		17	15	170	27	64	4400
Prod. 19	9.3		3.9	40	67	24	32	550
Prod. 20	1.1		2	52	50	24	7.7	530
Prod. 21	3.2		8.4	16	110	27	27	1400
Prod. 22	0.39	<0,01	0.7	9.8	68	39	7.5	630
Prod. 23	1.4	<0,01	0.75	25	130	35	11	750
Prod. 24	6.6	<0,01	< 0,5	38	210	52	1.9	1500
Prod. 25	2	<0,01	< 0,6	32	66	26	5.6	280

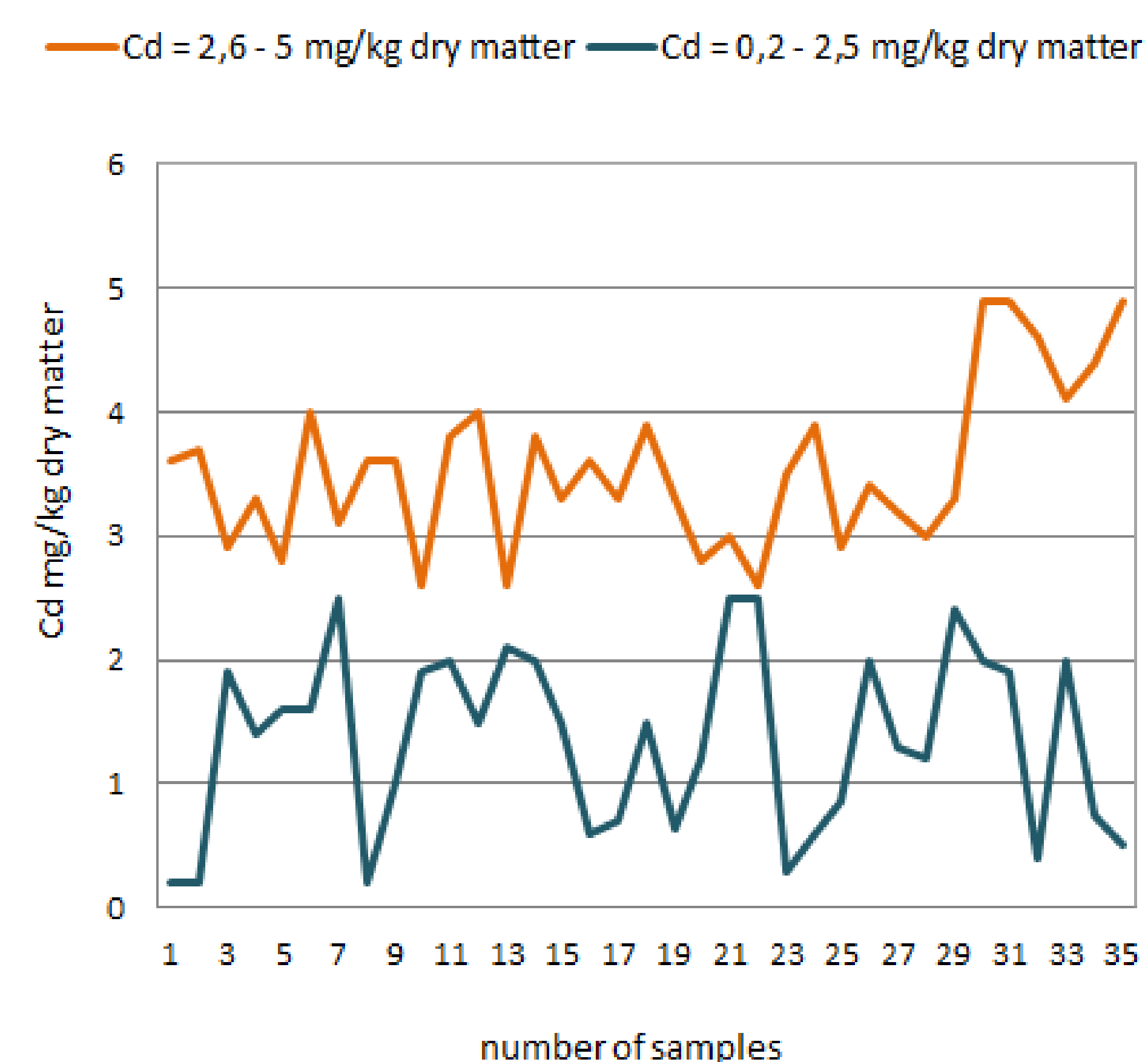


Fig. 4 Cadmium concentration in ashes in the years 2007-2013

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