



The sewage sludge ban in Switzerland

New concepts for recycled mineral phosphorous fertilisers

Jochen Mayer
Agroscope, Zurich, Switzerland

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The sewage sludge ban

Historic background

- Ban of use of sewage sludge as fertilizer in agriculture and horticulture from 1. May 2003
(Ordinance on the Reduction of Risks relating to the Use of Certain Particularly Dangerous Substances, Preparations and Articles, ORRchem)
- Stepwise implementation
 - Fodder crops and vegetables => May 2003
 - Other types of cultivation (mainly arable fields) => 2006 (2008)
- Decision part of Federal Council's implementation of [precautionary provisions](#) for protection of soil and health
 - Incineration of sludge, mainly in cement plants in Switzerland



The sewage sludge ban

Scientific background

- BSE crisis (Bovine spongiform encephalopathy, mad cow disease) provoked discussion about risks of sludge application in agriculture!
- Risk-benefit analysis by Agroscope in 2001/2002

Benefits

- Recirculation of nutrients, nitrogen, phosphorous and organic matter



The sewage sludge ban

Scientific background

Risks

- **Heavy metals** => controllable
- **Persistent organic pollutants** (PAH, PCB, Dioxins, etc.) => controllable
- **Pathogens** => difficult to control, inactivation required
- **Hormones** => difficult to control, inactivation?
- **Antibiotics** => difficult to control, inactivation?
- **Harmful substances** => pesticides, flame retardants, drugs, surfactants, metabolites, etc. => **large uncertainties** about variety (number) and performance, decomposition in soils and environment



The sewage sludge ban

Conclusions by Swiss authorities

... For this reason the Federal Council plans to **ban the use of sludge as a fertiliser**, although this will **mean breaking a nutrient cycle** which is in itself useful. **Prevention** – a key principle of the law on health and the environment – requires, however, that any **consequences for the environment** which could be damaging or negative **must be limited as early as possible**, even there is **no conclusive scientific evidence** for such damage being caused.



Ten years later...

Obligatory for P-Recycling

- From 01.01.2016 **obligatory for P-Recycling** from sludge, meat and bone meals (Ordinance for prevention and disposal of wastes, VVEA)
⇒ Transition period 10 years => 2026
- New fertilizer category: **Recycled mineral fertilisers** (MinRec)

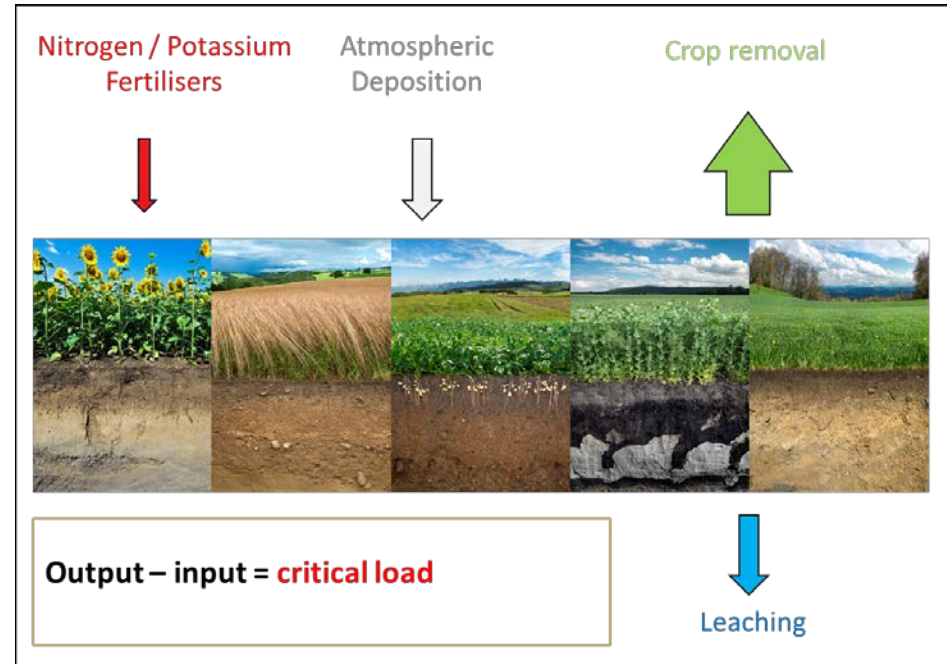


Recycled mineral fertilisers

Derivation of pollutant thresholds

Heavy metals

- Derivation based on **input - output balances** for Swiss arable farming.
- Calculation of a **critical load** corresponding to the pollutant load without accumulating pollutants in the soil.
- Threshold value referenced to phosphorus.
- Basis: standard P-fertilisation in Switzerland = **34.3 kg P ha⁻¹ year⁻¹**



$$\text{Threshold} [mg \text{ pollutant } kg^{-1} P] = \frac{\text{critical load pollutant} [g \text{ ha}^{-1}]}{34.3 [kg P \text{ ha}^{-1}]}$$

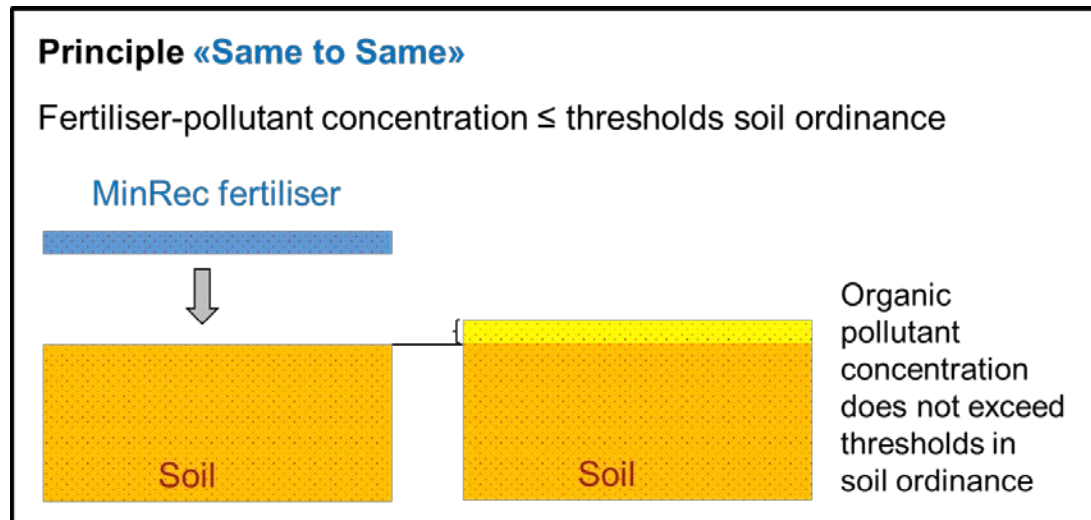


Recycled mineral fertilisers

Derivation of pollutant thresholds

Organic pollutants

- No withdrawal by plants, little degradation in the soil.
- Derivation on the basis of threshold values (concentrations) in the Swiss soil protection ordinance.
- Conversion to reference value phosphorus.





Recycled mineral fertilisers

Pollutants thresholds for MinRec

	Threshold
Heavy metals	
	(mg kg ⁻¹ P)
Arsenic	100
Lead	500
Cadmium	25
Chrome	1 000
Copper	3 000
Nickel	500
Mercury	2
Zinc	10 000
Organic Pollutants	
	(mg kg ⁻¹ P)
PAH1	25
PCB ²	0,5
	(ng I-TEQ kg ⁻¹ P)
PCDD/F ³	120

- **Threshold values** passed by the Swiss government at 31.10.2018
- Valid from January 2019 (Ordinance on the Reduction of Risks relating to the Use of Certain Particularly Dangerous Substances, Preparations and Articles, ORRchem)

PAH = Polycyclic aromatic hydrocarbons

PCB = Polychlorinated biphenyls

PCDD/F = Sum of polychlorinated n dibenzo-p-dioxins and polychlorinated dibenzofurans



Thank you for your attention

Jochen Mayer

jochen.mayer@agroscope.admin.ch

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Recycled mineral fertilisers

Derivation of pollutant thresholds

Application of **ALARA** principle
(**As Low As Reasonably Achievable**)

Schadstoff	Ansatz Definition Minimal-anforderung	Minimal-anforderung	Technisches Potenzial	Grenzwert MinRec
		mg kg ⁻¹ P		
Arsen	Bilanz	140	97	100
Cadmium	Bilanz	39	21	25
Nickel	Bilanz	890	313	500
Quecksilber	Bilanz	12	1.9	2
Zink	Bilanz	14000	8879	10000
Blei	Akkumulation	2842	416	500
Chrom	Akkumulation	1820	922	1000
Kupfer	Akkumulation	4931	2939	3000



Recycled mineral fertilisers

Derivation of pollutant thresholds

Definition and calculation of accumulation times

