

# **Minrec, the New Swiss Category for Recycling Fertilizers**

**Impressions of a researcher from the presentations in Berne 30th of  
August 2017**

**Anders Nättorp**

**School of Life Sciences, FHNW**

---

# Swiss legislation on waste

Landfill of organic materials forbidden since 2000

Sewage sludge not used in agriculture since 2006

## Phosphorus recycling

- New decree on solid waste since January 2016
- Sewage sludge and meat and bone meal
- 10 year transition period

**Verordnung  
über die Vermeidung und die Entsorgung von Abfällen  
(Abfallverordnung, VVEA)**

vom 4. Dezember 2015

Der Schweizerische Bundesrat,  
gestützt auf die Artikel 29, 30a Buchstabe c, 30b Absatz 1, 30c Absatz 3, 30d

thermisch zu behandeln. Dabei ist deren Energiegehalt zu nutzen.

**Art. 15** Phosphorreiche Abfälle

<sup>1</sup> Aus kommunalem Abwasser, aus Klärschlamm zentraler Abwasserreinigungsanlagen oder aus der Asche aus der thermischen Behandlung von solchem Klärschlamm ist Phosphor zurückzugewinnen und stofflich zu verwerten.

<sup>2</sup> In Tier- und Knochenmehl enthaltener Phosphor ist stofflich zu verwerten, soweit das Tier- und Knochenmehl nicht als Futtermittel verwendet wird.

<sup>3</sup> Soll der phosphorhaltige Rückstand als Dünger verwendet werden, so sind bei der Rückgewinnung des Phosphors Schadstoffe so weit zu entfernen, dass der Dünger die Anforderungen von Anhang 2.6 Ziffer 2.2 der Chemikalien-Risikoreduktions-Verordnung vom 18. Mai 2005<sup>4</sup> (ChemRRV) erfüllt.

**Art. 16** Angaben zur Entsorgung von Bauabfällen

<sup>1</sup> Bei Bauarbeiten muss die Bauherrschaft der für die Baubewilligung zuständigen

# Plans for New Swiss Legislation on fertilizer

---

## Recycling fertilizer (ChemRRV)

- No direct use of sewage sludge allowed
- Low limits for heavy metals
- Today no commercial process for recovery possible

## Introduction of mineral recycled fertilizer category planned

- Min P<sub>2</sub>O<sub>5</sub>, plant availability,...(DüV), contaminant limits (Chem RRV)
- Potential materials are sewage sludge ash, meat and bonemeal ash, wood ash

**The goal is to reduce the heavy metal input to the soil!**

## Selected, translated and commented info from the presentations of the Swiss Federal Office of Agriculture and the research institute Agroscope

Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Bildung und Forschung WBF  
Agroscope

### Schadstoffgrenzwerte für MinRec-Dünger

Karin Weggler, Walter Richner, René Reiser,  
Diane Bürge, Thomas Bucheli, **Jochen Mayer**

Phosphorrecycling: Wie weiter? 30. August 2017, Bern

www.agroscope.ch | gutes Essen, gesunde Umwelt

Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Eidgenössisches Departement für  
Wirtschaft, Bildung und Forschung WBF  
Bundesamt für Landwirtschaft BLW

### Die neuen gesetzlichen Regelungen für mineralische Recyclingdünger

**Bundesamt für Landwirtschaft**  
Fachbereich Agrarumweltsysteme und Nährstoffe

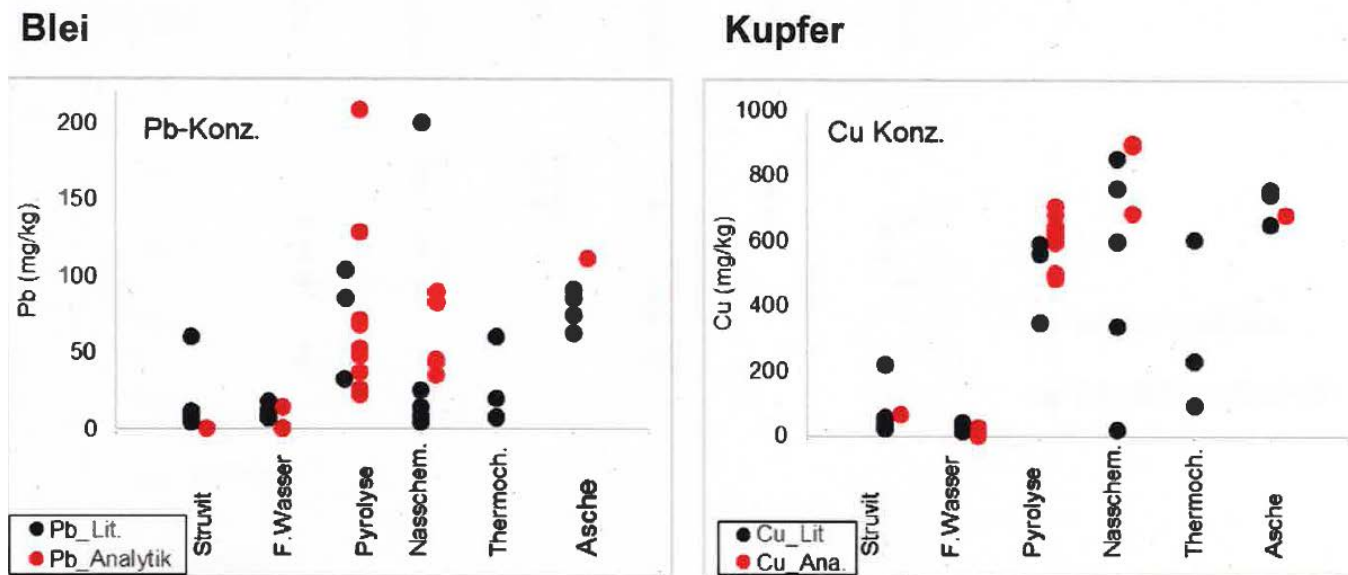
Michael Zimmermann

# Framework for Limits by Agroscope

## Balance of Input- Output (fertilizer+ atmospheric dep.- leaching- crop)

### Analysis of Recovered materials

- Own and literature
- Phosphorus, heavy metals, organic contaminants
- Precipitation, Sludge leaching, Sludge pyrolysis, ash leaching, ash thermochemical, ash as is



# Derivation of inorganic pollutants limits

---

**According to ALARA ("as low as reasonably achievable") principle:**

1. Load of each pollutant by material balance OR slow\* accumulation-> minimum requirements
2. Eliminate products which do not meet all minimum requirements.
3. Consider technical potential of the processes
4. Limit values as low as possible

\*at least 500 years accumulation until harmful levels (VBBo).

---

# ALARA

- 1) Minimal requirements
- 2) products that meet all minimum requirements

Contaminant	Method	Minimal- requirement (mg/kg P)	Minimal- requirement (mg/kg P)
Cadmium	Balance	39	39
Arsenic	Balance	140	140
Mercury	Balance	12	12
Nickel	Balance	890	890
Zinc	Balance	14100	14100
Chrome	Balance	420	1821
Lead	Balance	-	2842
Copper	Balance	1721	4931

*Precipitation,  
Sludge  
leaching*

*Precipitation,  
sludge leaching,  
ash leaching,  
thermochemical:  
8 Processes*

## 3) Technical potential for further reduction

Process	Cd	Ni	Cr	As	Hg	Pb	Zn	Cu
<i>Precipitation</i>	1.8	18	18	23	0.35	26	247	124
<i>Precipitation</i>	1.0	20	44	10	1.01	57	859	324
<i>Precipitation</i>	4.3	33	56	10	0.95	91	1010	468
<i>Sludge leaching</i>	8.5	<b>224</b>	141	68	1.90	116	<b>8879</b>	709
<i>Sludge leaching</i>	5.3	137		42	1.05	72	5421	433
<i>Ash leaching</i>	17.4	83	117	<b>121</b>	<b>8.70</b>	77	4791	<b>2939</b>
<i>Ash leaching</i>	<b>21.0</b>	129	313	97	0.10	159	6606	2047
<i>Thermochemical</i>	1.1	222	<b>922</b>	33	1.11	<b>222</b>	877	1078



## 4) Derivation of limits

Contaminant	Method Minimal requirement	Minimal-requirement (mg/kg P)	"State of the Art" (mg/kg P)	Limit MinRec (mg/kg P)
Cadmium	Balance	39	21	<b>25</b>
Arsenic	Balance	140	121	<b>100</b>
Mercury	Balance	12	8.7	<b>10</b>
Nickel	Balance	890	224	<b>250</b>
Zinc	Balance	14100	8879	<b>10000</b>
Chrome	Accumulation	1821	922	<b>1000</b>
Lead	Accumulation	2842	222	<b>250</b>
Copper	Accumulation	4931	2939	<b>3000</b>

*Accumulation until tolerable limit VBBo for chrome: 920 y  
Accumulation until tolerable limit VBBo for lead: > 10'000 y  
Accumulation until tolerable limit VBBo for copper: 1057 y*

# Organic pollutants limits from Agroscope report

Schadstoff	Grenzwert
Polyzyklische aromatische Kohlenwasserstoffe (PAK)	25 Gramm pro Tonne Phosphor (P) <sup>1</sup>
Polychlorierte Biphenyle (PCB)	0.5 Gramm pro Tonne Phosphor (P) <sup>2</sup>
Dioxine (PCDD) und Furane (PCDF)	120 Nanogramm I-TEQ pro Kilogramm Phosphor (P) <sup>3</sup>

<sup>1</sup> Summe der folgenden 16 PAK-Leitverbindungen der EPA (Priority pollutants list): Naphthalin, Acenaphthylen, Acenaphthen, Fluoren, Phenanthren, Anthracen, Fluoranthren, Pyren, Benzo(a)anthracen, Chrysen, Benzo(b)fluoranthren, Benzo(k)-fluoranthren, Benzo(a)pyren, Indeno(1,2,3-c,d)pyren, Dibenzo(a,h)anthracen und Benzo(g,h,i)perylen.

<sup>2</sup> Summe der 7 Kongeneren gemäss IRMM (Institute for Reference Materials and Measurements), IUPAC-Nr. 28, 52, 101, 118, 138, 153, 180

<sup>3</sup> I-TEQ = Internationale Toxizitätsäquivalente

# Düngerverordnung (DüV):

---

## Art. 5 Terms

**2 For the purposes of this Regulation:**

**a. Farming fertilizer: ...**

**b. Recycled fertilizer: ...**

**c. Mineral fertilizer: ...**

**d. Mineral recyclable fertilizers: fertilizers with nutrients partly or wholly obtained from municipal waste water, sewage sludge or sewage sludge ash;**

**e. ...**

---

## Art. 11 Regulations for certain fertilizers

**<sup>11</sup> For mineral recycled fertilizers with secondary phosphorus, the phosphorus and phosphate solubility must be declared with neutral ammonium citrate (PA) and 2% citric acid (PC) and the designation "with secondary P"**

- Agronomic quality must be indicated twice
  - Mineral recycled fertilizers must be recognizable as such
-

# Comparison Limits

## Organic Recycling Fertilizer CH and EU Fert. Reg.

Contaminant	Limit MinRec (mg/kg P)	Organic Recycling Fertilizer <sup>a)</sup> mg/kg P	EU fert reg. recaclulated (PFC1 C) EU <sup>b)</sup> mg/kg P
Cadmium	25	286 (50)*	46
Arsenic	100		(600) 200
Mercury	10	286	20
Nickel	250	8571	1200
Zinc	10000	114285	Spurennährstoff
Chrome	1000	(2000)**	(20)***
Lead	250	34285	(1500) 200
Copper	3000	28751	Spurennährstoff

a) Limits ChemRRV for compost and digestate, assumptions 3.5 kg P/t (BAFU study, 2007)

b) draft EU Fert. Reg., Recalculation from DM to P assuming 10% P content

\* Min. fertilizer mg/kg P

\*\* Min. fertilizer mg/kg TS

\*\*\* Cr<sup>VI</sup>

# Conclusion and Outlook

---

## **Large interest in phosphorus recovery in Switzerland**

- stakeholders have pronounced opinions and plans for implementation
- coverage in radio and press

**Public consultation of MinRec category will follow and entry into force  
1.1.2019 planned**

**Co-development of recovery implementation aid with stakeholders is  
about to start**

---

**Thank you for your time and your attention!**



→ Contact:

Anders Nättorp

School of Life Sciences, FHNW

[anders.naettorp@fhnw.ch](mailto:anders.naettorp@fhnw.ch) +41 61 228 5521

## **Definitions compared to EU fertilizers regulation**

- New category “mineral recycling fertilizer” (DüV)
  - Limits for MinRec (ChemRRV)
  - Types (DüBV) remain unchanged.
  - DüBV specifies nutrient content, solubilities, packaging and labeling.
  - Input material: sludge new as raw material for mineral fertilizers
  - Mineral content: less than 10% organic material
-



# Requirements for market introduction

---

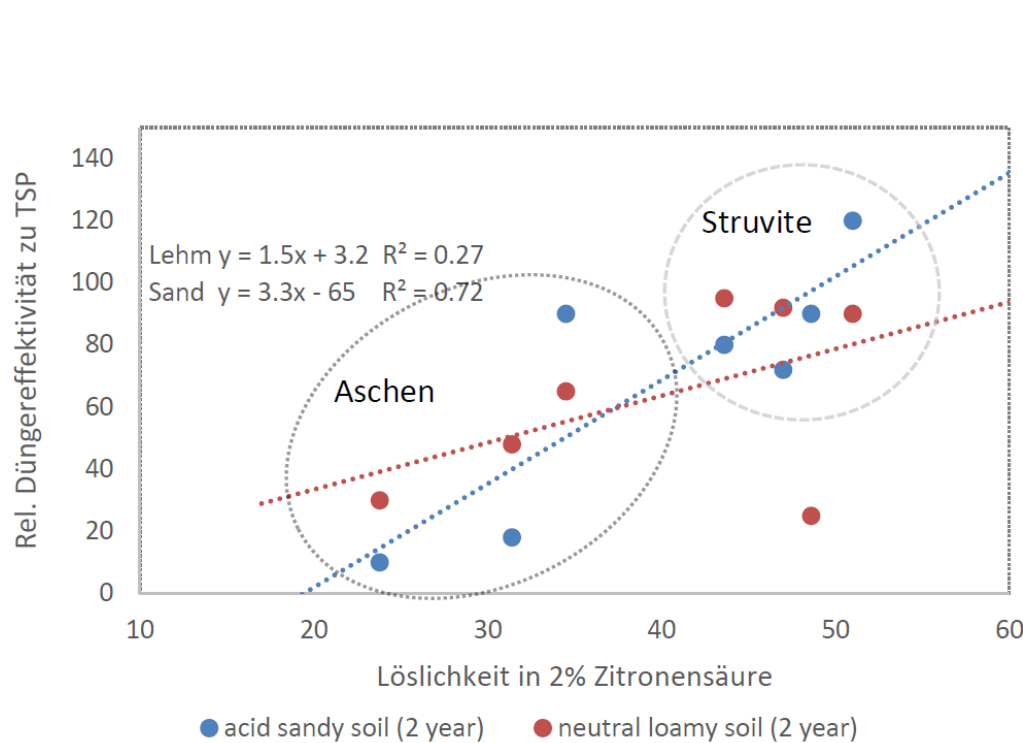
- 1) **Information on the origin and recovery procedures of the secondary phosphorus**
  
- 2) **Laboratory analysis of nutrient contents (including solubilities) and pollutants**
  - Compliance with limit values of heavy metals
  - Compliance with limit values of organic pollutants
  - Analysis of chromate (Cr<sup>VI</sup>)

**Analysis for microbiological residues, if not from a thermal process, with the following limit values:**

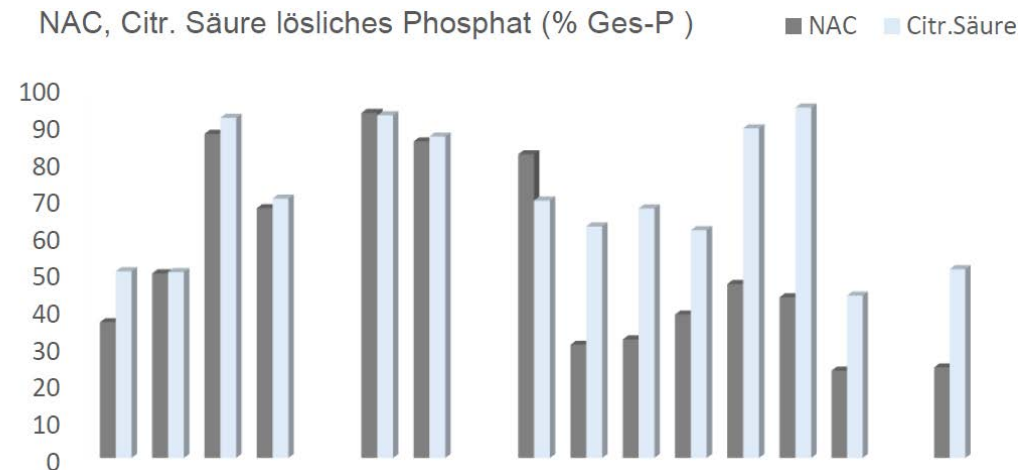
<b>Contaminant</b>	<b>Limit</b>
Salmonella spp.	Not detectable in 25 g
Escheria coli	1000 cfu/ g
Enterococcaceae	1000 cfu/ g

---

# Agronomic quality according to Agroscope report



Analysed MinRec Materials



“Agronomic quality is better characterized by the combination of the extracts neutral-ammonium citrate (PA) and 2% citric acid (PC) better than by water solubility”