



European Sustainable Phosphorus Platform

*Circular approaches to phosphorus: from research to deployment, Berlin, 4th March 2015*

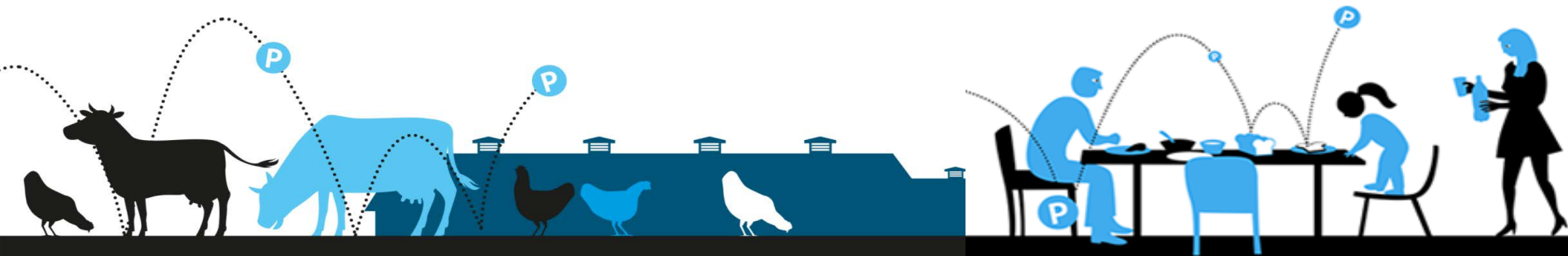


# European Sustainable Phosphorus Platform

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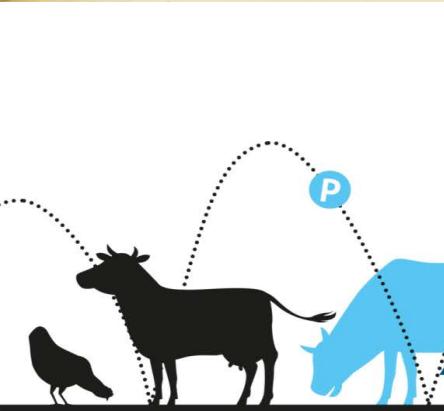
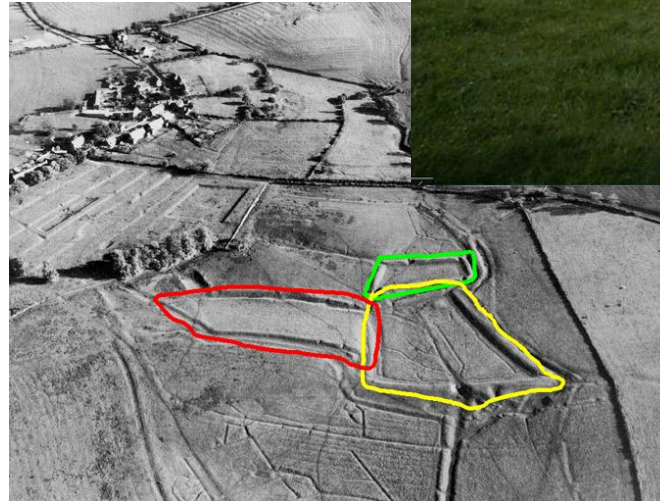
[www.phosphorusplatform.eu](http://www.phosphorusplatform.eu)

[@phosphorusfacts](https://twitter.com/phosphorusfacts)





# *P-recycling: a long tradition*

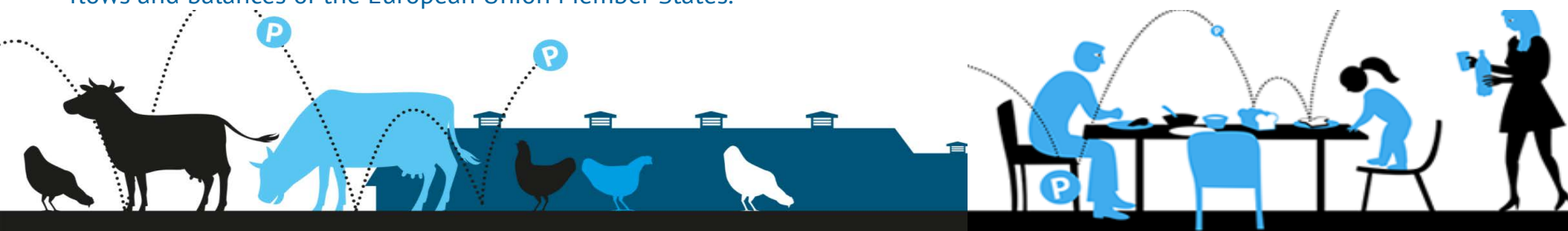


## *P recycling potential in EU-27*

[kton P/year - 2005]	Total	Recycled	Potential
Sewage sludge	297	115	182
Biodegradable solid waste	130	38	92
Meat & bone meal	128	6	122
<b>Total</b>	<b>427-555</b>	<b>153-160</b>	<b>274-396</b>
<b>Manure recycling =</b>	<b>1 736</b> (plus c. 70 produced not recycled)		
<b>Mineral fertiliser use =</b>	<b>1 448</b>		

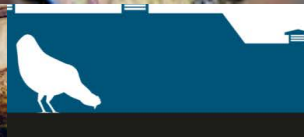
Van Dijk & Oenema "Overview of phosphorus flows in wastes in Europe", 2013, Fertilisers Europe seminar, 6 Feb. 2013.

Updated Van Dijk et al. in preparation 9/2014 and Van Dijk, K. C., Lesschen, Jan Peter and O. Oenema (Submitted). "Phosphorus flows and balances of the European Union Member States."



## **P-sources**

- **Livestock manures**
- **Wastewater treatment**
- **Food wastes**
- **Food processing, abattoirs,**
- **Industry**
- **Bio-fuels production**



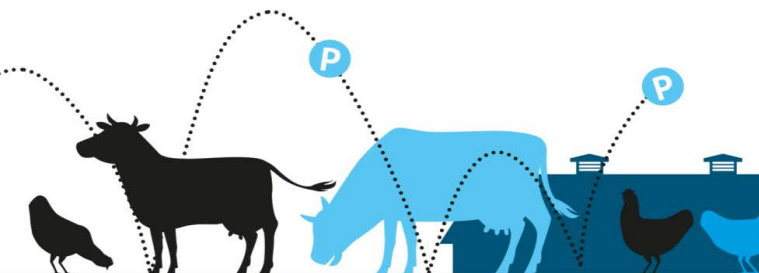
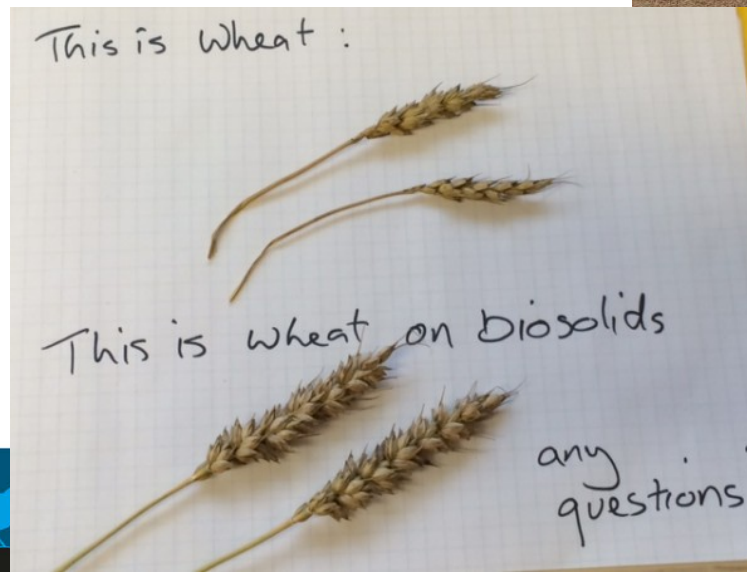
## *P reuse & recycling routes*

### **➤ Agricultural use of treated biosolids, composts and digestates**

- recycling of N, C
- c. 50% of EU sewage sludges
- IF20 Brittany: 400 000 tonnes of manure

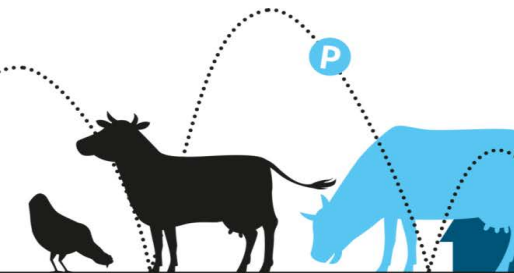
### **Pressures:**

- **spatial distribution**
- **contaminants**
- **social perception**



## *P reuse & recycling routes*

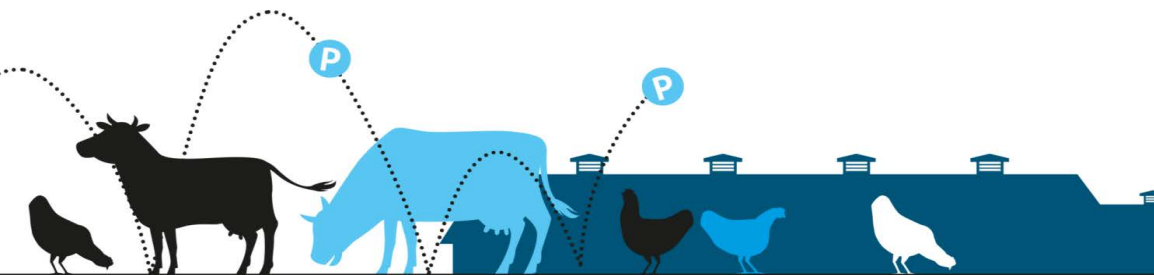
- *Use of biosolids / wastewater to feed biomass or energy crop production*



## *P reuse & recycling routes*

### ➤ **Adsorption to produce a fertiliser / soil amendment**

- *Organic materials:  
posidonia, straw, ...*
- *(Calcinated) shells*
- *Biochar*
- *Minerals (natural, artificial)*





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[www.ostara.com](http://www.ostara.com)

## *P reuse & recycling routes*

### ➤ **Precipitation processes**

- *side-streams or concentrated streams*
- *e.g. struvite, calcium phosphate*



*DHV Crystallactor 1993*

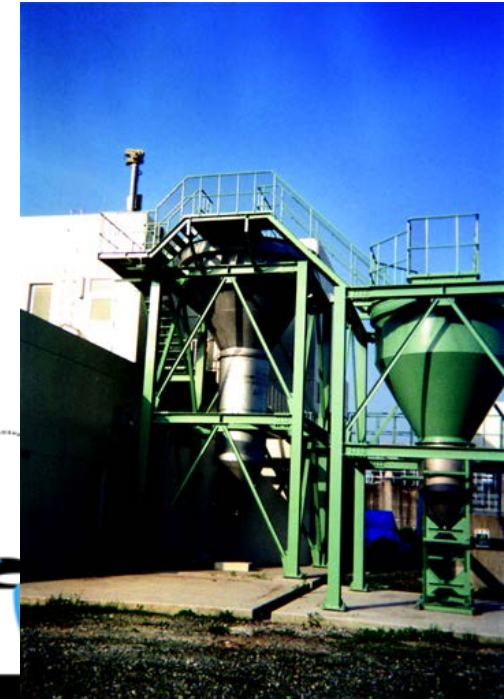


<http://www.bwb.de/content/language1/html/6946.php>



 **Berliner Pflanze**  
Der mineralische Langzeitdünger

*Unitika, 1998*

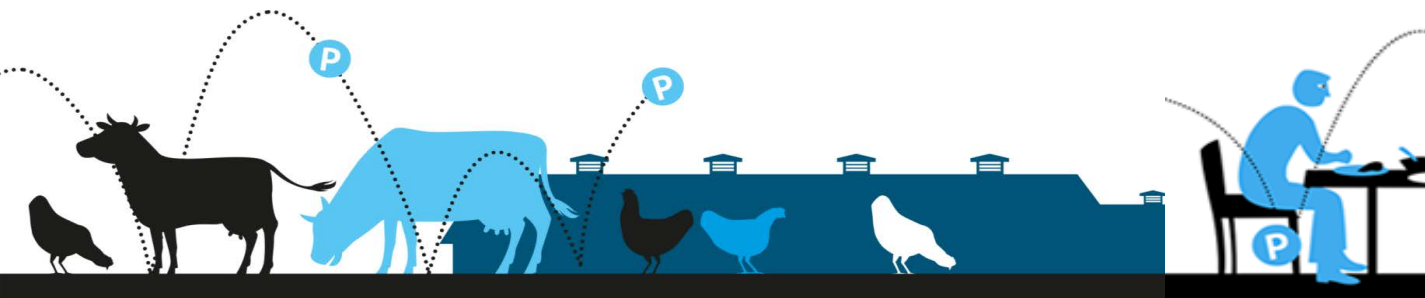




## *P reuse & recycling routes*

### *➤ Using ashes in existing industry processes*

- sludge incineration ash*
- meat and bone meal ash*
- Thermal P4 process (e.g Recophos AU)*
- EcoPhos low grade materials*
- Fertiliser industry*



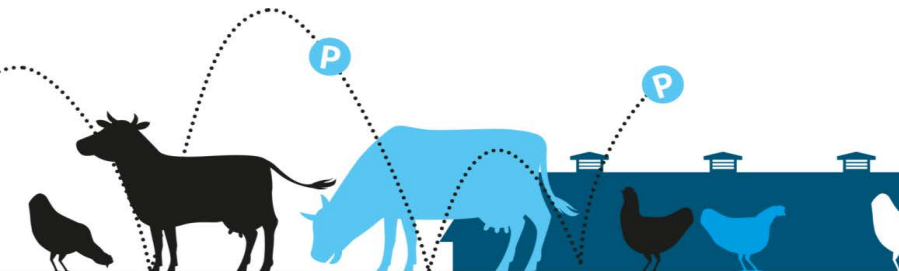
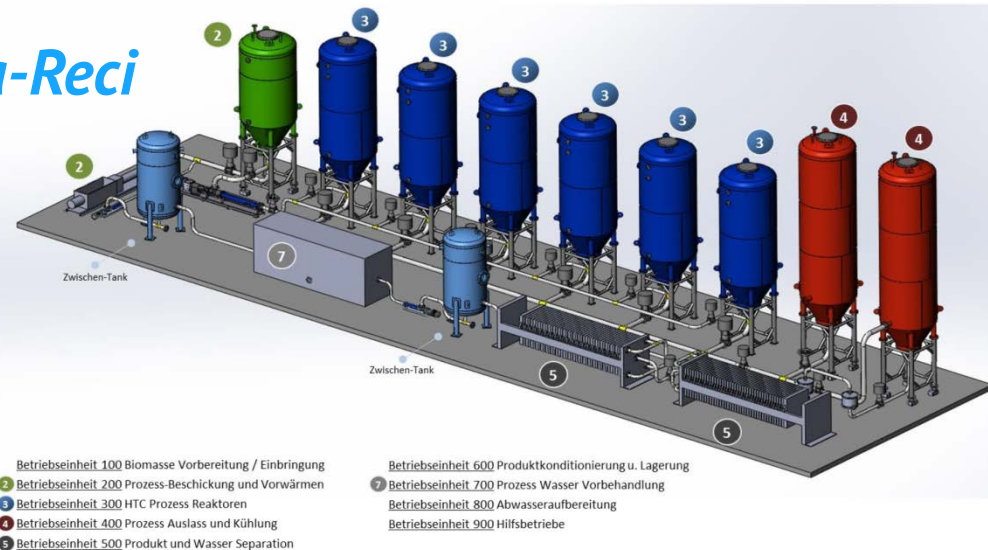


## P reuse & recycling routes

➤ **P-extraction from ashes**  
using acids, pressure,  
temperature

E.g. AshDec /Outotec, Recophos (D),  
Leachphos, Cleanphos,  
Phoxnan/Loprox, Mephrec, Aqua-Reci

...



## P reuse & recycling routes

### ➤ Other processes

- Budenheim: low temperature CO<sub>2</sub> from sewage sludge
- Nano-filtration / membranes
- Ion exchange
- ???



US 20120070360A1

(19) **United States**  
 (12) **Patent Application Publication** (10) **Pub. No.: US 2012/0070360 A1**  
**Wissemborski et al.** (43) **Pub. Date: Mar. 22, 2012**

(54) **PHOSPHATE RECOVERY FROM SLUDGE**

**Publication Classification**

(76) Inventors: **Rüdiger Wissemborski**,  
 Gau-Algesheim (DE); **Rainer  
 Schnee**, Mainz (DE); **Rainer  
 Wallwitz**, Niedemhausen (DE);  
**David Kümmet**, Budenheim (DE)

(51) **Int. Cl.**  
**C01B 25/12** (2006.01)  
 (52) **U.S. Cl.** ..... **423/304**

(57) **ABSTRACT**

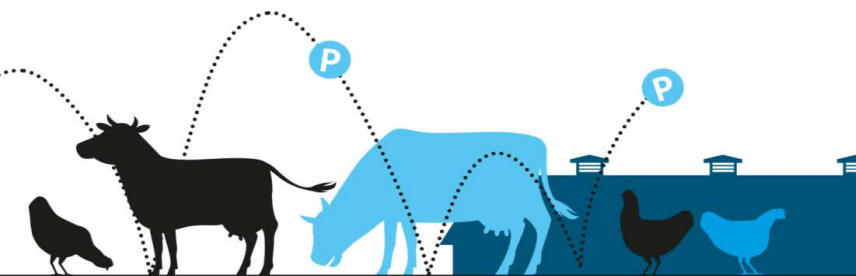
(21) Appl. No.: **13/318,228**  
 (22) PCT Filed: **Apr. 30, 2010**  
 (86) PCT No.: **PCT/EP2010/055936**

A process for recovering reusable materials, in particular phosphate, from sewage sludge products, namely sewage sludge, sewage sludge ash or sewage sludge slag, by extraction, in which a suspension of the sewage sludge product is produced in water, alcohol, water-alcohol mixture or an aqueous solution, gaseous carbon dioxide (CO<sub>2</sub>) or supercritical carbon dioxide (scCO<sub>2</sub>) is introduced as an extraction agent into the suspension of the sewage sludge product, undissolved solids are separated from the liquid suspension agent, carbon dioxide is removed from the suspension agent, and reusable materials dissolved in the suspension agent are precipitated and separated from the suspension agent.

§ 371 (c)(1),  
 (2), (4) Date: **Nov. 23, 2011**

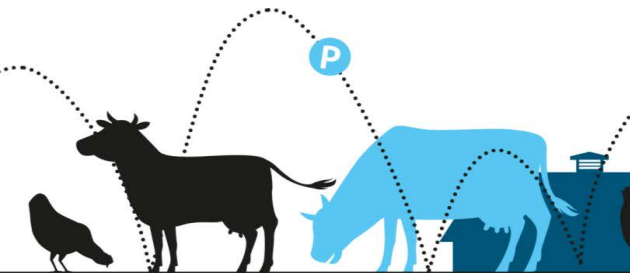
(30) **Foreign Application Priority Data**

May 11, 2009 (DE) ..... 10 2009 020 745.7



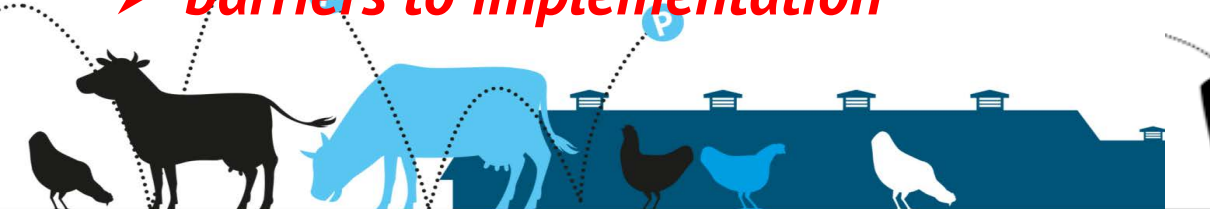
## Synergies

- *Food waste collection*
- *Biological nutrient removal, ANAMMOX, DEamMON ...*
- *Methanisation*
- *Eco-san*
- *Water reuse*
- *N recycling*
- *Organic carbon*



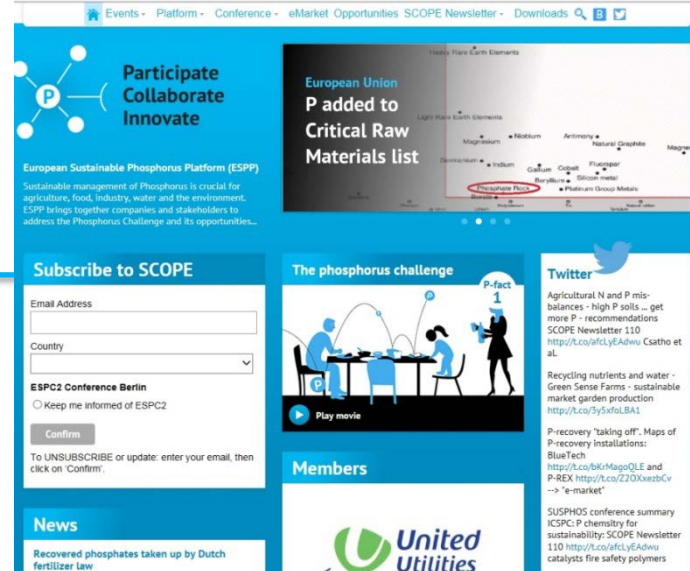
## Status of R&D

- *ongoing since early 1990's*
- *proven processes*
- *user acceptance of product, e.g.*
  - *agronomic value of struvite*
  - *adaptation to farmers' spreading equipment*
  - *traceability*
- *appropriateness to waste/water industry*
  - *complexity, chemicals*
  - *cost*
- *no single solution*
- *barriers to implementation*



# European Sustainable Phosphorus Platform

- **Launched 2013**
  - **Network of innovation & expertise**
  - **Dialogue: other sectors, stakeholders**
  - **Recycling: user value chain**
  - **Regulatory monitoring, input**
  - **Perspectives & strategy**
  - **Visibility of Members' actions**
- Join us !**


November 2014 n° 109

## SCOPE NEWSLETTER

### Phosphorus reuse and recycling

#### ESCo MAFOR France Farm use of organic by-products

France publishes expert report on recycling of nutrients in residual materials

#### P-recovery articles review Update scientific publications inventory

WETSUS rolling inventory of scientific publications on P-recovery technologies. And 2 selected articles:

#### Hybrid zeolite/lanthanum hydroxide sorbent

### ECIP - EU Dairy Industry Vision for sustainable phosphorus

Drive to sustainable intensification requires improving phosphorus use efficiency

### Challenges Phosphorus chemistry

Issues around phosphorus use, chemistry and applications

### Review Phytate and health

Phytate in diets can reduce mineral uptake but may have beneficial health effects



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