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# **Upcoming events**

### ICL opening event for phosphorus recycling installations

ICL Fertilizers, one of the world's largest fertiliser companies and a founding member of ESPP, is organising an official opening event for phosphate recycling installations at their Amsterdam mineral fertiliser factory, **March 7<sup>th</sup> 2019**. The installation will enable use of bone meal ash and sewage sludge incineration ash as raw materials in commercial phosphate fertiliser production. Speakers will include the North Holland Province, which provided financial support to this project, and the Chair of the Netherlands chemicals industry federation VCNI.

To participate: <u>Arme.Padt@icl-group.com</u>

#### **Global Nutrient Management webinar**

European Sustainable

Phosphorus Platform

GPNM (UNEP Global Partnership on Nutrient Management) is organising a one-hour <u>webinar</u> at 9h00 EST (15h00 Paris time) on **7**<sup>th</sup> **March**: "Global Nutrient Management Toolbox: Meet Local and Global Nutrient Goals and Reduce Harm to the Environment." With United Nations Environment, INMS (International Nitrogen Management System), UN FAO and World Resources Institute.

Information and registration:

https://connect.wri.org/webmail/120942/927805032/11241b2582ea4d8b7192192bedf9c4a2ca57c4b3a67d04db957b60b9d461ab74

## 1<sup>st</sup> Summit of the Organic Fertiliser Industry in Europe (SOFIE)



Organised for the organic\* fertilisers industry across Europe by ESPP, in partnership with IFS (International Fertiliser Society), **5-6 June 2019, Brussels** <u>SOFIE</u> will address:

- The agronomic science behind claims of organic fertilisers concerning nutrients, soil health, environment

- Industry and market perspectives, including quality,
- innovation, export opportunities
- Circular Economy

- European regulatory challenges, especially the new EU Fertilising Products Regulation (with the European Commission)

This is the first ever European conference for the organic

fertilisers industry, and will facilitate networking across Europe of organic fertiliser producers (including composts, digestates, biochars ...), organic waste processors / recyclers, fertiliser distributors and experts and advisors to these industries, including





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applied agronomists, agricultural outreach services, regulators, etc. Already confirmed participation today: European Commission, Eurofema, ECOFI, UNIFA, 4R-Group, Fertikal, SoilFood, SILC Fertilizzanti and Biolan.

The SOFIE organic fertilisers summit will back-to-back to the IFS technical conference (International Fertiliser Society), 4-5 June <u>www.fertiliser-society.org/event/2019-ifs-technical-conference.aspx</u>

More information: <u>www.phosphorusplatform.eu/SOFIE2019</u>

Registration: www.eventbrite.co.uk/e/sofie-organic-fertilizers-summit-tickets-55703185728

\* note: "Organic Fertilisers" here refers to nutrient products containing organic carbon, not to organic 'non chemical' farming. The programme is currently under finalisation. Companies interested in a stand to present their products / services, and experts interested to speak, etc. please contact <u>info@phosphorusplatform.eu</u>

## Waste water phosphorus removal tomorrow: ambitions and reality

Joint ESPP event 9 October 2019, Liège, Belgium. In the context of the current revision of EU water policy (Water Framework Directive, Waste Water Treatment Directive), and with participation of the European Commission (DG ENVI, DG RTI), this workshop will enable dialogue between the water industry, experts and policy makers (EU, national) on perspectives for phosphorus removal:

- low discharge consents
- flexible permitting / emissions trading
- P-removal from small sewage works

Presentations will be by water companies and sewage treatment operators (presenting results of trials on-site in real operating conditions and experience of operation in sewage works) and by policy makers, with discussion with panels of experts. Presentations will include the final results of the UKWIR CIP trials of phosphorus removal technologies. Technology suppliers and RTD projects will be able to present their processes, innovation and research on stands during the day.



In partnership with / supported by: IWA (the International Water Association), Eureau, CIWEM (Chartered Institution of Water and Environmental Management). Université de Liège and EC

Water and Environmental Management), Université de Liège and ECSM'19 (European Conference on Sludge Management), Liège 6-8 October 2019 <u>https://events.uliege.be/ecsm2019</u>

At University of Liège, city centre, 45 minutes - one hour direct train from Brussels or from Brussels Airport.

To propose a presentation or stand, and to pre-register: contact info@phosphorusplatform.eu

### 9th International Phosphorus Workshop (IPW9)



"Putting phosphorus first? How to address current and future challenges". The 9<sup>th</sup> International Phosphorus Workshop (<u>IPW9</u>) will take place at ETH **Zurich**, **Switzerland**, **8-12 July 2019**. IPW brings together experts working on phosphorus in terrestrial and aquatic systems, both managed and (semi-)natural, including experts on phosphorus recycling. IPW9 expects participants from universities and research institutions, government agencies, NGOs and industry from all around the world. IPW9's objectives are to: discuss concepts which drive research and use of phosphorus in our societies, review progress in knowledge and technology, define questions for future phosphorus-related research and actions. The conference will be structured in five interdisciplinary themes: (1) phosphorus scarcity; (2) optimizing regional and national phosphorus cycles; (3) sourcing phosphorus fertilisers; (4) efficient phosphorus use in agroecosystems; and (5) environmental phosphorus problems.

Website IPW9 www.ipw9.ethz.ch

#### Save the date: ESPC4

The 4th European Sustainable Phosphorus Conference is fixed for Vienna, 15-17 June 2020.

See more events at www.phosphorusplatform.eu/upcoming-events

# **European policies**

### **ESPP** input to EU Ecolabel consultation

ESPP made input to the public <u>consultation</u> on the EU Ecolabel scheme suggesting that Ecolabels be developed for fertilising products (fertilisers, soil improvers, biostimulants ..), in coherence with the new EU Fertilising Products Regulation. ESPP also supported application of the Ecolabel to the food & beverage sector (because of its footprint on phosphorus use and losses). *EU public consultation on EU Ecolabel scheme to 3<sup>rd</sup> March 2019: <u>http://ec.europa.eu/environment/ecolabel/index\_en.htm</u>* 





## STRUBIAS update

Following the finalisation of the EU Fertilisers Regulation text (see previous ESPP eNews), the EU JRC has announced that although the STRUBIAS (Struvite and phosphate salts, Biochars and pyrolysis materials, Ashes) report is now finished, it has been decided to revise the wording to take into account the final Fertilisers Regulation text, in particular concerning by-products and animal by-products. The final report will then be published as an EU 'Science for Policy Report' in "coming months"

For further information, see ESPP regulatory page <u>www.phosphorusplatform.eu/regulatory</u>

#### Pressures on European water

The European Environment Agency (EEA) has published a <u>summary</u> of ecological status and pressures on Europe's freshwater, seas and underground water resources. Nearly 75% of groundwaters are in "good" chemical status, and the quantities of water used have decreased by nearly 20% since 1990, but less than 40% of surface waters achieve "good" ecological status (the objective fixed for 2015 by the EU Water Framework Directive 2000/60). The main problems identified for surface waters are nutrient losses from agriculture, airborne chemical pollution and building works which destroy habitats. The emergence of other pollution challenges such as pharmaceuticals is noted. EEA underlines the need to adapt water management to climate change, which will lead to floods, droughts and extreme weather. Increased temperatures or lower flows will aggravate impacts of pollutants.

"Water is life. Europe's rivers, lakes and seas are under pressure from pollution, over-exploitation and climate change. How can we ensure a sustainable use of this vital resource?", European Environment Agency, EEA Signals 2018, ISBN: 978-92-9213-980-3 <a href="http://www.eea.europa.eu/publications/eea-signals-2018-water-is-life/at\_download/file">www.eea.europa.eu/publications/eea-signals-2018-water-is-life/at\_download/file</a>

#### Over fifty organisations and experts support CAP nutrient tool



More than 50 companies, organisations and scientifists have signed a statement to support the farm nutrient balance tool (<u>FaST</u>) in the European Commission's <u>proposed</u> text for the next CAP (Common Agricultural Policy). The proposed tool would ensure that all farmers across Europe develop a minimum "nutrient balance" calculation, using either an "app" developed and provided by the EU or other compatible existing national or private tools. Currently around half of farmers in the United Kingdom, for example, do not have any farm nutrient calculation in place. ESPP has communicated the position to relevant MEPs (European Parliament) and Council (Member States).

European Commission presentation of FaST (Farm Sustainability Tool for Nutrients) https://circabc.europa.eu/sd/a/a2be04f2-fb29-4545-9355-85e9f8738170/4c%20-

<u>%20FaST.pptx</u> and online "demonstrator" <u>www.rebrand.ly/fast-demonstrator</u>

Summary of FaST: ESPP eNews n°25 <u>www.phosphorusplatform.eu/eNews025</u>

European Commission proposal for new CAP <u>https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap\_en</u>

Position supporting the FaST proposal www.phosphorusplatform.eu/regulatory

#### EU Resource Efficiency Knowledge Centre (EREK)

The EU has launched the <u>EREK</u> knowledge centre to help companies, in particular SMEs, save energy, material and water costs. The centre aims to facilitate access to information and expertise and provide training and capacity-building, including information on relevant EU, national and regional support schemes. A Self-Assessment Tool is available for companies online. EREK organises workshops across Europe on resource efficiency, the circular economy and eco-innovation.

EREK (European Resource Efficiency Knowledge Centre) website www.resourceefficient.eu/en

# Phosphorus removal and recycling

#### EasyMining to build a phosphorus recovery plant in Germany



In Germany, <u>EasyMining</u>, an innovation company in the Ragn-Sell group, has <u>signed</u> an agreement with utilities operator <u>Gelsenwasser</u>, aelectricity, gas and water for the Münster and Ruhr regions, one of Germany's largest utilities with 1.2 billion euro turnover. They will carry out a feasibility study with the objective to build a full-scale plant for

phosphorus recovery from sewage sludge incineration ash, using the EasyMining Ash2Phos technology. <u>Ragn-Sells</u>, is a waste and recycling company with over 2 500 staff in Sweden, Norway, Denmark and Estonia. The plant will be located in Bitterfeld-Wolfen (South of Berlin, near Leipzig) and is expected to have capacity to treat around 60 000 tonnes of sewage sludge incineration ash per year, starting in 2023. The Swedish government is during 2018-2019 investigating a proposed legislation of banning sewage sludge on arable land and also requiring recovery of phosphorus. Lisa Wigh from Ragn-Sells has been <u>appointed</u> to the Swedish Government consultative expert panel on phosphorus recycling from sewage sludge. Ragn-Sells is





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currently the largest actor in Sweden that is restoring resources from sewage sludge to arable land, through use of sewage sludge on farmland.

"Ragn-Sells and Gelsenwasser enter partnership on phosphorus recovery in Germany", 3 October 2018 www.mynewsdesk.com/ragnsells/pressreleases/ragn-sells-and-gelsenwasser-enter-partnership-on-phosphorus-recovery-in-germany-2733520 and www.aquatechtrade.com/news/aquatech-news/swedish-partnership-kickstarts-germanys-phosphorus-recovery-drive

### Phosphorus recycling could in theory cover P-fertiliser demand in Italy

An overview <u>study</u> estimates agricultural requirements for phosphorus (P) inputs in Italy at just over 100 000 tP/year, compared to phosphorus contents of livestock manure and municipal wastewater at 119 000 and 40 000 tP/y. Crop demand was estimated from regional production of different crops, multiplied by each crop's phosphorus removal coefficient. However, the secondary phosphorus sources are produced at a constant rate throughout the year, whereas agricultural demand is concentrated in the Spring and Autumn. Also, geographical distribution of secondary phosphorus sources, related particularly to livestock production, does not correspond to agricultural phosphorus needs, related mainly to grain production. The Lombardy region, especially shows a very high phosphorus surplus, but also Piemonte, Veneto and Campania, whereas Puglia, Sicilia, Marche and Cambria show phosphorus deficits.

"The Balance Between Capturing Phosphorus from Manure and Wastewater and the Demand for Crop Fertilizer in Italy", D. Caniani et al., Natural Resources Research 2018 <u>http://doi.org/10.1007/s11053-018-9426-z</u>

#### **Overview of manure nutrient recovery processes**

A 22-page <u>summary</u> from Washington State University (WSU) presents different nutrient recovery technologies applicable to cattle manure. Cost and performance indicators, including potential product revenue and avoided costs, are estimated for a "scrape" system producing 130 litres/day of slurry, based on data provided via NEWTRIENT (see SCOPE Newsletter <u>n°125</u>) for dairies with 1 000 – 3 000 cows. The review identifies three levels of processing: solid-liquid separation, "partial advanced nutrient separation" (recovery of certain nutrients in a concentrated form, e.g. phosphate salts) and clean water (where the liquid fraction is purified to levels where it can be used for irrigation or other uses). Technologies considered include solid-liquid separation by screw press/screens, centrifuge, flocculation, pressure membranes (ultrafiltration); struvite precipitation, nitrification / denitrification, ammonia stripping, membrane water clarification, evaporation and combined systems. Conclusions are that CAPEX can vary from US\$4 to US\$77 per cow, and OPEX from US\$12 to US\$317 per cow/year, with higher costs as expected being associated with higher treatment performance. For different dairy farms, reduction of phosphorus, or ammonia nitrogen or of manure volumes may be more important, with a key factor being the percentage of manure requiring transport away from the farm.

"Approaches to nutrient recovery from dairy manure", C. Frear et al., Washington State University, February 2018 <u>http://pubs.cahnrs.wsu.edu/publications/pubs/em112e</u>

See other WSU publications on manure nutrient recovery technologies and on ammonia recovery from manure digestate in ESPP eNews <u>n°30</u>. See also ARBOR overview of digestate processing technologies, SCOPE Newsletter <u>n°100</u>, review of technologies for nutrient recovery from digestates, M. Romero-Güiza et al. in ESPP eNews <u>n°15</u> and NEWTRIENT catalogue of manure processing technologies and technology suppliers, SCOPE Newsletter <u>n°125</u>

### TL-Biofer project conclusions: nutrient recycling via microalgae



The EU LIFE <u>TL-BIOFER</u> Project Final Workshop, <u>18th September 2018</u> brought together 40 persons in Murcia, Spain. Results of four years of development and testing of nutrient removal and recovery from sewage using microalgae cultivation in biofilm were presented and discussed, including the microalgae bio-based fertilisers agronomical tests. A 252 litre/hour prototype was operated for 24 months at El Viso WWTP, Cordoba, Spain. The Twin-Layer system uses an ultrathin, microporous outer layer on which microalgae develop (a selected strain of Scenedesmus sp.) and a macroporous inner layer through which the tertiary wastewater is distributed for nitrogen (N) and phosphorus (P) removal. Removal rates in the TL pilot plant reached up to: 68% N (98% ammonium) and 58% P, but higher removal potential are foreseen with improved cultivation materials and design. The microalgae can be

recovered by manual scraping of the cultivation layers without any need of mechanical dewatering. The harvested microalgae were dried by lyophilisation showing 8.5% N (over 40% protein), 2% P2O5 and 1.5% K2O contents, with very low levels of heavy metals (less than 1 ppm for Cd, Hg, Cr, Ni, and Pb, and zinc 79 ppm, copper 20.5 ppm). Lyophilised microalgae were used for solid (together with vegetable compost and biochar) and liquid (by different extraction methods) bio-based fertilisers formulations, with no detectable pathogen and conform to the EC revised Fertiliser Regulation (Dec 2018) PFC criteria for organic, non-microbial biostimulants or blended fertilisers. Agronomical pot trials on barley and rye grass were performed by CEBAS-CSIC research institute in Murcia, showing promising fertiliser results with biostimulants effects.

TL-Biofer project information <u>www.life-tlbiofer.eu</u> and BIOMASA PENINSULAR <u>www.bpeninsular.com</u>. Summary video <u>https://drive.google.com/file/d/1bGUfT1SoHFCzzc-ACfxxmGRfpB1IpWBR/view</u> and project conclusions layman's summary <u>https://drive.google.com/file/d/1HK3Vk4za-Y5lcdPDUpQ\_0-8\_yqrba4bY/view</u>



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## Ellen MacArthur report on circular economy for food



The Ellen MacArthur Foundation's (EMF) new report "Cites and Circular Economy for Food" was launched at the World Economic Forum Davon 2019. The report highlights a number of issues that reveal the need for a radical change in direction for our current global food system and states that "Less than 2% of the valuable nutrients in food by-products and human waste generated in cities is valorised".

The report estimates (see <u>technical</u> <u>appendix part 3</u>) that for the 6.7 trillion US\$ (tr\$) the world spends annually on food, society pays 11.6 tr\$ health and environmental costs, see table.

6.7 tr\$ (trillion US\$) = world Spending on food	6.7 tr\$ = farmers' real co 5.7 tr\$ = "externality" costs of food production	osts, food industry and 1.7 tr\$ health costs related to agricultural production	I supermarket costs and margins In particular: - nearly 1 tr\$ for exposure to pesticides <sup>1</sup> - 0.3 tr\$ for antimicrobial resistance, through "excessive" use of antibiotics in intensive livestock and aquaculture
		<i>4 tr\$</i> environmental costs	Food waste, greenhouse emissions, soil degradation, water use, nutrient losses
	5.9 tr\$ = health costs related to food consumption	3.5 tr\$ for malnutrition	
		1.6 tr\$ for micronutrient deficiencies	
		0.8 tr\$ for obesity	

EMF proposes three ambitions to address these problems: (1) growing food regeneratively, and in or near cities where appropriate, (2) reducing food waste and recycle; and (3) design and marketing of healthier food products.

On **objective 1** – *regenerative or local<sup>2</sup> production*: regenerative production is considered to mostly concern on-soil farming outside city boundaries, and to cover approaches such as rotational grazing, agro-ecology, organic farming, conservation agriculture, more circular aquaculture systems, etc. The report also suggests that a maximum of 1/3 (by weight) of food consumed in cities could be produced within cities by converting 1.5% of existing urban area, plus rooftops (based on 100% of roof area considered to be potential for PV), to indoor farming, aquaponics or similar, but notes that this is unlikely to be achieved and that it concerns only production of fruit, vegetables and fish, whereas cities would remain reliant on more distant rural areas for other crops.

On **objective 2** – *reduce food waste and recycle*: the report emphasis reducing food waste, which is currently around 1/3 of world food production, improving collection of food waste and avoiding its contamination (e.g. by non-biodegradable packaging), recycling of food by-products into new food products, bio-materials, energy and inputs for agriculture (organic matter and nutrients).

On **objective 3** – *healthier food products*: the report emphasises the role of industry in pushing dietary change, towards less meat and more plant-based products, promoting products with circular economy production inputs, design to reduce downstream food waste, and use of food industry by-products in new recipes.

(1) The health cost for exposure to pesticides is stated in the report to concern only "farm workers" but in fact seems to be extrapolated from a figure cited of 0.17 tr\$ for the EU in 2013 and which seems to concern the whole population. The reference is iPES Food which may refer to the iPES Food 2017 report <a href="http://www.ipes-food.org/img/upload/files/CFP\_FullReport.pdf">www.ipes-food.org/img/upload/files/CFP\_FullReport.pdf</a> which states that organophosphate pesticides were estimated to have a health cost as endocrine disrupting substances (EDCs) of 121 billion US\$/year (ref. 329, Trasande et al. 2016)

(2) The report suggests that 40% of the world's cropland is located within 20 km of cities, based on Thebo 2017 which states concludes that 35% of non-irrigated cropland and 60% of irrigated are within 20 km of an urban area of > 50 000 population. Thebo 2017 "A global, spatially-explicit assessment of irrigated croplands influenced by urban wastewater flows" <u>https://doi.org/10.1088/1748-9326/aa75d1</u>

Ellen MacArthur Foundation "Cities and Circular Economy for Food" 2019 and "Technical appendix" <u>www.ellenmacarthurfoundation.org/our-</u> work/activities/cities-and-circular-economy-for-food





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## Phosphorus removal technologies for small sewage works

A review from Newcastle University and Northumbrian Water Ltd, UK, summarises technologies available and perspectives for phosphorus (P) removal in small sewage works (<250p.e.). The authors note that negative impacts of phosphorus release from small treatment works may be underestimated. They note that technologies developed for larger works may be not be applicable in many small works because of accessibility problems, lack of onsite management (posing issues for handling of chemicals) and monitoring, high variability in flows and wastewater composition including variability of inflow pH, challenges for sludge management. Three approaches are considered: physico-chemical in particular active filter media (absorptive media), chemical dosing and ion-exchange, algae and adapted EBPR (biological phosphorus removal). Chemical precipitation Premoval is often impractical in small works because of handling and storage of caustic chemicals and management of excess sludge generated. Phosphorus sorption media show promise, in particular in constructive wetlands where other contaminants can be removed and which can buffer changes in flow rates. Challenges are however space requirement, the need for a continuous minimum flow rate and progressive saturation of sorption media, requiring periodic reconstruction of the wetland. Ion exchange technologies show potential, but require further work to show reliability at full scale, adaptability to variations in flow and cost effectiveness (including chemical requirements for regeneration). Novel EBPR systems also show potential (e.g. AnoxAN, MABR Membrane Aerated Biofilm Reactors or granular sludge systems), but complexity, operating and maintenance requirements currently exclude application in small sewage works. Use of algae shows significant promise, including the green microalgae Scenedesmus sp. and Chlorella sp. both of which have been shown to carry out 'luxury' phosphorus uptake in appropriate conditions (the same mechanism as in biological P-removal EBPR). Effectiveness and compactness can be improved with technologies such as osmotic membrane photobioreactors, algal biofilm reactor and low-energy artificial light. Performance over time, operation in cold climates and under varying flow need to be demonstrated, as do low-technology costeffective processes for separating/recovering the generated algal biomass. Overall, the authors note a considerable lack of realworks, long-term trial experience in small sewage works and an absence of relevant cost information.

"A Review of Phosphorus Removal Technologies and Their Applicability to Small-Scale Domestic Wastewater Treatment Systems", J. Bunce, E. Ndam, I. Ofiteru, D. Graham, Newcastle University, UK and A. Moore, Northumbrian Water, UK, Frontiers in Environmental Science, 6:8, https://doi.org/10.3389/fenvs.2018.00008

#### Struvite tested as a flame retardant

Struvite (magnesium ammonium phosphate) is today recovered from municipal wastewater and other waste streams. It is generally used as a fertiliser. In two recent studies, struvite has been successfully tested as a flame retardant. Yetilmezsoy et al. (who previously tested struvite as a fertiliser on different plants, see SCOPE Newsletter <u>n°121</u>) demonstrated a flame retardancy effect of struvite by simply placing powdered struvite powder in or on wood and cotton). In a second paper, Guo et al. generated struvite in situ within wood (0.8 mm Norway spruce veneer), by vacuum impregnation of the wood with magnesium sulphate and potassium phosphate aqueous solutions (3 x 1 hour), wiping clean, then fumigation by ammonia for 10 hours, then leaching to remove remaining soluble salts. This method, not compatible with use of recovered struvite, resulted in just over 20% (by volume) loading of struvite in the wood. The struvite mineralised wood veneer could not be ignited by a small flame (untreated veneer ignited in two seconds) and showed significantly improved fire resistance. The authors suggest that struvite acts as a flame retardant by absorbing energy in decomposition in heat, releasing non flammable gases and water, and by releasing amorphous magnesium phosphate (MgHPO4) which promotes char formation.

"Utilization of Struvite Recovered from High-Strength Ammonium-Containing Simulated Wastewater as Slow-Release Fertilizer and Fire-Retardant Barrier", K. Yetilmezsoy et al., Environ. Technol. 2018 <u>https://doi.org/10.1080/09593330.2018.1491642</u> "Bioinspired Struvite Mineralization for Fire-Resistant Wood", H. Guo et al., ACS Appl. Mater. Interfaces 2019, 11, 5427–5434 <u>https://doi.org/10.1021/acsami.8b19967</u>







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Slideshare presentations: www.slideshare.net/NutrientPlatform

