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## Upcoming events

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

#### 5-6 June 2019, Brussels

Organised for the organic\* fertilisers industry across Europe by ESPP, in partnership with IFS (International Fertiliser Society), SOFIE will address:

- The agronomic science behind claims of organic fertilisers concerning nutrients, soil health and environment
- Industry and market perspectives, including quality, innovation and export opportunities
- Circular Economy
- European regulatory challenges, especially the new EU Fertilising Products Regulation (with the European Commission)

The SOFIE organic fertilisers summit will back-to-back to the IFS technical conference (International Fertiliser Society) 4<sup>th</sup> – 5<sup>th</sup> June [www.fertiliser-society.org/event/2019-ifs-technical-conference.aspx](http://www.fertiliser-society.org/event/2019-ifs-technical-conference.aspx)

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 applied agronomists, agricultural outreach services, regulators, etc.

\* 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 [info@phosphorusplatform.eu](mailto: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 (IPW9) 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. IPW 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 [www.ipw9.ethz.ch](http://www.ipw9.ethz.ch)

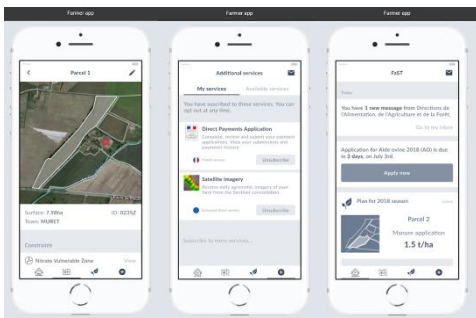
## Save the date: ESPC4

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

See more events at [www.phosphorusplatform.eu/upcoming-events](http://www.phosphorusplatform.eu/upcoming-events)

## Consultations and calls for information

### Join the initiative to support the farm nutrient balance tool proposal (FaST) !



ESPP is collecting support for maintaining the farm nutrient balance tool (FaST) in the European Commission’s proposed text for the next CAP (Common Agricultural Policy). The objective is to demonstrate science and industry support for this initiative, which will ensure and facilitate that all farmers across Europe develop a minimum “nutrient balance” calculation. Currently around half of farmers in the United Kingdom, for example, do not have any farm nutrient balance calculation in place. The Commission’s FaST proposal includes development of a [smart phone tool](#), made available to farmers, which will provide information on applicable regulations and enable entry of nutrient data, field by field. Member States and farmers will also be free to use other existing tools to enter their nutrient balance, subject to reporting compatibility (e.g. national

nutrient balance systems, farm advisory service tools ...). ESPP is asking the European Parliament and Member States to maintain the FaST nutrient tool in the new CAP as a mandatory condition for all farmers receiving EU subsidies. **Organisation wishing to support this, please sign the [joint statement](#) available at [www.phosphorusplatform.eu/regulatory](http://www.phosphorusplatform.eu/regulatory) (under “Common Agricultural Policy”) and send to [info@phosphorusplatform.eu](mailto:info@phosphorusplatform.eu), including name of your organisation, logo of organisation, and name and email of person to be included as contact.**

European Commission presentation of FaST (Farm Sustainability Tool for Nutrients) <https://circabc.europa.eu/sd/a/a2be04f2-fb29-4545-9355-85e9f8738170/4c%20-%20FaST.pptx> and online “demonstrator” [www.rebrand.ly/fast-demonstrator](http://www.rebrand.ly/fast-demonstrator)

Summary of FaST: ESPP eNews n°25 [www.phosphorusplatform.eu/eNews025](http://www.phosphorusplatform.eu/eNews025)

European Commission proposal for new CAP [https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap\\_en](https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en)

### EU JRC call for data and publications on recycled manure products



The European Commission JRC has renewed a call for study data or publications concerning the agronomic effects of processed manure or fertiliser products recycled from manure. This is part of the DG ENVI “SafeManure” study addressing application limits for recycled fertilisers produced from manure (“processed manure” under the Nitrates Directive). The data must include experimental data (pot or field trials, leaching tests ... not only review) comparing processed manure / manure recycled product to mineral fertiliser and to a control.

JRC is interested in any nitrogen-containing material recovered from or processed from any type of animal manure, slurry or litter, with manure only as input material or manure mixed with other materials (minimum c. 10% manure): including e.g. mineral products recovered from manure processing (such as struvite or other precipitated salts containing nitrogen, ammonium salts recovered from biogas ...), “mineral concentrates” (from membrane separation), digestate, compost, dried - pelletised – or limed manure or similar, manure ashes / processed ashes, biochars / pyrolysis materials, etc.

Data should address, in conditions relevant for Europe, one or more of the following: nitrogen plant uptake / efficiency / impact on crop yield, and/or nitrogen leaching. For e.g. struvite, data should enable to relate crop yield to nitrogen application (not only to phosphorus). The objective is to compare the agronomic performance and/or potential environmental impacts of the nitrogen

present in the processed manure materials to those of mineral nitrogen fertilisers. The mineral fertilisers compared may be the same as the recovered product (e.g. comparison of ammonium sulphate from digester gas stripping with synthetic ammonium sulphate) or may be different (e.g. comparison of synthetic urea with dried manure). Information provided should be in English or and English summary/translation must be provided (e.g. summary and translation of headers of data tables). Full pdfs of literature should be provided.

You can check a list of studies already received by JRC at [www.phosphorusplatform.eu/regulatory](http://www.phosphorusplatform.eu/regulatory) (under “SafeManure documents”), indicating which studies have been assessed to be useable (24 to date) and which have been rejected (and why).

Please send any relevant data by 10<sup>th</sup> February 2019 to: [info@phosphorusplatform.eu](mailto:info@phosphorusplatform.eu) (unless data is confidential) and we will forward to the European Commission (JRC).

## EU consultation on circular product policy

EU public consultation “Towards an EU Product Policy Framework contributing to the Circular Economy”, open to 28 January 2019. You can provide your input via [https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-2409307/public-consultation\\_en](https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-2409307/public-consultation_en)

## EU consultation open on water policy

A public EU consultation is open to 4th March 2019 “Fitness Check of the Water Framework Directive and the Floods Directive”. You can provide your input via [https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184/publicconsultation\\_en](https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184/publicconsultation_en)

## Call for EU Focus Group members – soil contamination

The European Commission is calling for experts to participate in an EIP-AGRI Focus Group on “Protecting agricultural soils from contamination”. Focus Groups are coordinated by the European Commission over 1-2 years to collate information, define research needs (input to EU R&D funding programmes) and propose themes for EU Rural Development Funding agriculture ‘Operational Groups’. The Focus Group will address contamination of agricultural soils across Europe, including industrial and consumer chemicals and waste disposal, and consider risks of uptake by crops and livestock, and so possible human health threats. The Focus Group aims to identify innovative farm management methods and best practices to prevent and remedy soil contamination. **Candidature for the Focus Group is open until Monday 11<sup>th</sup> February 2019.** Experts must submit CV and motivation.

EU EIP-AGRI call for experts to participate in Focus Group on “Protecting agricultural soils from contamination” – open to 11<sup>th</sup> February 2019. Applicant experts can include farmers, farm advisers, socio-economic experts, and operators with practical experience. [https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/20181219\\_calltext\\_fg34-38.pdf](https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/20181219_calltext_fg34-38.pdf)

## Diet and health

### Scientists claim that diet phosphorus may make us “lazy” and inactive

#### MailOnline Controversial food additive 'used in bacon, sausages and fizzy drinks makes you lazy and impairs your metabolism', warn researchers

- 25% of adults consume more than the recommended daily intake of phosphate
- The additive is used to prolong the shelf life of some foods and add flavour
- Researchers at the University of Texas conducted the study on humans and mice

A controversial additive added to bacon, sausages and fizzy drinks can make you lazy, according to research.

Tests have also uncovered evidence that phosphate, heavily consumed in the Western diet, can impair metabolism.

Scientists warn the results add to a 'growing chorus' of voices calling for levels of phosphate should be curbed in the food industry.

Estimates suggests a quarter of adults consume at least three times more of the food additive than is recommended.

Phosphates are added to an array of foods to prolong their shelf life and add flavour.

less). Serum phosphorus increased significantly (approx. +50%) in the high P diet mice (again, not specified if this is fasting level). Muscle tissue from the trial mice was analysed for gene expression, showing downregulation of genes involved in fatty acid metabolism, whereas genes for glucose metabolism were upregulated. The in vitro tests using C2C12 mouse muscle cells

A study by medical researchers in Ohio and Texas, with human population data, mice trials including gene expression analysis from the mice's muscle tissue and adipose fat, as well as in vitro cell tests, suggests that high phosphorus (P) levels in diet may lead to lower physical activity and modified fat metabolism. The human study is based on 1 603 healthy persons in the Dallas Heart Study (DHS-2) cohort. Blood phosphorus levels (serum Pi, not specified if fasting) were correlated to exercise data from a 7 day wrist monitor (after factoring for renal function, body mass index BMI and several other parameters). ESPP comment: this data alone is not convincing because both the blood phosphorus and exercise frequency could be the result of other health or lifestyle factors. The animal study fed normal (0.9% P) or high (2% P) phosphorus diets to adult mice (number of mice used not specified) for 12 weeks, after which they were submitted to a treadmill exercise test and a “metabolic cage” test. High P diet mice stopped running significantly earlier than normal P diet mice (c. -20% time) and also showed lower oxygen uptake. The 12-hour metabolic cage test showed that the high P mice showed statistically significantly less spontaneous physical activity (around -10%



exposed to different concentrations of inorganic phosphate, confirmed similar changes in gene expression. The authors conclude that the high P diet could lead to reduced fat metabolism in muscle cells, resulting in exercise intolerance.

Other previous studies have noted possible links between phosphorus diet intake and lipid metabolism (Hazim 2014, Tanaka 2013, Lind 1993, Farghani 2011, Shin 2014, Trautvetter 2018, Gutierrez 2018). In particular, [Imi et al., 2018](#), found (also in mice) that a high-P diet led to lower body fat mass and modified lipid metabolism gene expression. Other studies give somewhat different indications, including that increased P may correlate to reduced weight gain in rats (Nakao 2015, Tani 2007) and to reduced obesity / weight increase in humans (Ayoub 2015, Celik 2011, Obeid 2013, Lindegarde 1977).

The study has obtained media coverage, suggesting that phosphate food additives may “stop us exercising”, make us sedentary, and “impair metabolism” and referring to other studies possibly linking phosphorus intake to cardio vascular disease (CVD) or kidney disease (CKD). The authors indicate that a quarter of the US population has dietary phosphorus levels three times higher than “recommended” levels (taken from [Lee & Cho 2015](#)). This is however misleading: the [RDAs](#) are the intake adequate for health, not maximum limits. The European Food Safety Agency concluded in 2015 that no upper safety limit was necessary for phosphorus in diet (see SCOPE Newsletter [n°112](#)). The study authors call for regulation to require labelling of phosphorus content in foods.

US RDAs (Recommended Daily Allowance) [https://ods.od.nih.gov/Health Information/Dietary Reference Intakes.aspx](https://ods.od.nih.gov/Health%20Information/Dietary%20Reference%20Intakes.aspx) DRI for adults for phosphorus = 0.7gP/day. European Dietary Reference Values for phosphorus (EFSA), see [www.phosphorusplatform.eu/Scope112](http://www.phosphorusplatform.eu/Scope112)

“Controversial food additive ‘used in bacon, sausages and fizzy drinks makes you lazy and impairs your metabolism’ warn researchers”, Mail 9 January 2019 [www.dailymail.co.uk/health/article-6573635/Controversial-food-additive-used-bacon-makes-lazy.html](http://www.dailymail.co.uk/health/article-6573635/Controversial-food-additive-used-bacon-makes-lazy.html)

“Does this common food additive stop us exercising?”, Medical News Today, 9 January 2019 [www.medicalnewstoday.com/articles/324131.php](http://www.medicalnewstoday.com/articles/324131.php)

“High-Phosphate Diet Induces Exercise Intolerance and Impairs Fatty Acid Metabolism in Mice”, P. Peri-Okonny et al., Circulation (American Heart Association), 2019, 139 <http://dx.doi.org/10.1161/CIRCULATIONAHA.118.037550>

## EAT-Lancet Commission launches “Food Planet Health” report



Funded by the Wellcome Trust, with the medical journal The Lancet, the [EAT-Lancet Commission](#) has engaged 37 leading world experts in a [three-year process](#) to define what dietary patterns would enable to meet UN Sustainable Development Goals whilst optimising human health. The report is published as a 47 page Lancet scientific journal article ([open access](#)) and as a media [summary](#). The report concludes that a healthy diet would include 500 g/day of vegetables and fruit, 230g whole grains, 125g legumes and nuts, with (optionally, and as maximums) 30g/day of chicken/poultry and <20g/day of other meat and/or of fish. Changing to such a diet from current trends (BAU, 2050) would, it is estimated, prevent around 11 million premature deaths per year and reduce greenhouse emissions by around 50%. Mineral nitrogen fertiliser use is however estimated to be only reduced by around 5% and mineral phosphorus fertiliser by 8%. Biodiversity loss would be increased by more than 25% despite cropland use being unchanged: this expected loss of biodiversity is stated to be related to land use changes in tropical countries, but is not clearly explained, nor are proposals put forward to prevent this. The EAT-Lancet Commission estimates 8 million tonnes per year as a maximum sustainable level of “phosphorus application” (uncertainty range 6 – 16 Mt, as P) and 90 million tonnes for nitrogen (N) (range 65-130). It is not specified what is meant by “phosphorus application”, but this seems to mean P in mineral fertilisers only (it is stated that manure is assumed 100% recycled). These limits are

based on eutrophication risks related to losses from both agriculture and from untreated sewage, and the higher boundaries are indicated to correspond to recycling of nutrients from sewage to agriculture (presumably because untreated sewage would not then reach the environment). This proposed limit of 8 MtP/year is less than half current world mineral P fertiliser consumption (16 – 22 MtP/y see SCOPE Newsletter [n°128](#), which matches the 18 MtP/y “phosphorus application” baseline for 2010 indicated by EAT-Lancet). It is estimated that a combined scenario of: sustainable diet, reduced food waste and strongly improved agricultural methods would reduce “phosphorus application” from 28 MtP/y (BAU, 2050) to 13 MtP/y and “nitrogen application” from 200 MtN/y (BAU, 2050) to 121 MtN/y, so in both cases use would still be well above the proposed boundary limit.

“Food Planet Health. Healthy diets from sustainable food systems”, EAT-Lancet Commission summary report, January 2019 [www.eatforum.org](http://www.eatforum.org) and [www.thelancet.com/commissions/EAT](http://www.thelancet.com/commissions/EAT)

“Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems”, W. Willett et al., The Lancet Commissions January 16, 2019 [http://dx.doi.org/10.1016/S0140-6736\(18\)31788-4](http://dx.doi.org/10.1016/S0140-6736(18)31788-4)

## Regulatory

### EU Fertilisers Regulation approved by Member States

Text of regulation with changes, as agreed in trilogue, can be found at <http://data.consilium.europa.eu/doc/document/ST-15103-2018-INIT/en/pdf>

## Standard for declaration of Critical Raw Materials in electrical equipment



A proposed new European Standard ([PREN 45558](#)) for declaration of Critical Raw Materials (CRMs) in “energy related products” (i.e. products covered by the EU Ecodesign Directive 2009/125, effectively electrical and electronic equipment) was submitted to vote of CEN-CENELEC (JTC10) on 28 December 2018. The standard, integrated into the existing IEC 62474 standard (“Material declaration for products of and for the electrotechnical industry”) concerns all CRMs listed on the EU Critical Raw Materials List (as updated), both “regulated” CRMs (i.e. subject to specific measures under the Ecodesign Directive) and “non-regulated” CRMs (which include phosphate rock and white phosphorus P<sub>4</sub>). The standard concerns however only CRMs present in the final product, not process chemicals or emissions during production, so P<sub>4</sub> is not concerned whereas phosphate rock could be considered to be covered by

content of total phosphorus. Declaration of non-regulated CRMs is not obligatory under the Ecodesign Directive, but the new standards specifies how such CRMs should be declared if companies do so under voluntary schemes such as Ecolabels: how to measure, declaration for different equipment components, etc.

Proposed draft European standard PREN 45558 “General method to declare the use of critical raw materials in energy related products”  
[www.eera-recyclers.com/files/cen-clc-tc10sec126dc-secretary-enquiry-pren45558-use-of-critical-raw-materials-2.pdf](http://www.eera-recyclers.com/files/cen-clc-tc10sec126dc-secretary-enquiry-pren45558-use-of-critical-raw-materials-2.pdf)

## Recycled phosphorus from manures

### European Commission finds pharmaceuticals in manures



The [report](#) of a European Commission [study](#) of organic contaminants manures shows “significant” presence of veterinary pharmaceuticals (fungicides and antibiotics) in cattle urine, cattle manure, and cattle manure digestate. Nearly 490 different compounds were analysed, including also pesticides, herbicides and personal care chemicals. Of these, some sixty compounds (12%) were detected above quantification levels, with veterinary pharmaceuticals at “significant” levels. Twelve substances were detected in the urine or unprocessed manure, and eleven in digestate, whereas over thirty were found in soils and even more in surface waters in a livestock production region. This report is based on a literature review and data from a pilot sampling survey in Slovakia. It aims to provide a methodology (“compound fishing”) for an EU-wide sampling campaign.

European Commission “Scientists investigate effects of cattle manure on water quality”, 18 December 2018

<https://ec.europa.eu/jrc/en/news/scientists-investigate-effects-cattle-manure-water-quality>

“Residues of antimicrobial agents and related compounds of emerging concern in manure, water and soil Part 2 – Final data set of a pilot campaign and outline for an EU-wide monitoring assessment”, B. Gawlik et al., JRC Technical Report, 2018, ISBN 978-92-79-96693-4

<http://dx.doi.org/10.2760/280841>

### Summaries of manure nutrient recovery technologies

Several new publications from the USA provide useful updates on manure processing technologies and on nutrient recovery from manures.

A 16-page update [summary](#) by Washington State University aims to increase awareness of emerging cattle manure nutrient recovery technologies. Typical data on composition and nutrient contents of (cattle) manure, raw and after solids separation or lagooning, is provided. Information on nutrient form and availability for manure digestate, separated solids, struvite, recovered ammonium sulphate (stripping), vermicompost, showing that these effectively provide macronutrients to crops (nitrogen, phosphorus, potassium) and also micronutrients, as well as improving soil health (biological and physical). A bibliography of studies of fertiliser performance of different processed manure products is provided.

A second [report](#) summarises economic assessment of cattle manure digestate processing for nitrogen recovery: primary solids separation, fine solids separation (DAF dissolved air flotation), and ammonia stripping (with ammonium sulphate recovery). Assessment was based, for all three stages, on commercial and pilot scale operating installations. For ammonia stripping, trials were one full scale batch installation, one full scale continuous, and two pilot scale tests of process improvements, achieving up to 40% ammonia nitrogen removal in the two stage solids separation, and a further 50 - 75% in ammonia recovery. Total net cost was estimated at nearly 700 000 US\$ total over 10 years operation for a 100 000 gallon/day system, but with break even in case of a 17% increase in electricity price (base price 0.065 US\$/kWh) or a 30% increase in co-digestion substrates.

“Nutrient recovery: products from dairy manure to improve soil fertility”, Washington State University, C. Benedict et al., FS305E, Sept. 2018

<https://research.libraries.wsu.edu:8443/xmlui/bitstream/handle/2376/13105/FS305E.pdf>

“Technologies for Dairy Nutrient Recovery Evaluation of Low-impact Ammonia Stripping with Bio-Fertilizer Recovery and Support for Technology Decision Making”, Water Research Foundation, T. Ewing et al., 2018, STAR-N3R14b/4856b

<http://wp2.cahnr.wsu.edu.s3.amazonaws.com/wp-content/uploads/sites/32/2018/12/STAR-N3R14b-web.pdf>

## Research and implementation

### Effectiveness of a buffer strip in reducing phosphorus runoff

Data is [analysed](#) for an unmanaged 5 meter vegetated buffer strip (VBS) after 57 years (1954-2011) in Manitoba, Canada (Whitemouth river basin, near Elma). The buffer strip has lush vegetation and sediment accumulation. The field uphill from the buffer strip has a slope of 1 - 2 %. Soil phosphorus status in the buffer strip (at 0 - 5 m horizontal distance across the strip) is compared to field soil samples from uphill of the buffer strip (at -1 to -5 m). Radioactive carbon dating of soil samples indicate that soil erosion was occurring uphill in the field with sediment depositing just uphill from or in the buffer strip. Phosphorus analysis showed retention of total phosphorus (P), Olsen extractable P and 0.01 CaCl<sub>2</sub> extractable P in the buffer strip, with higher phosphorus saturation nearer the surface, but suggest that the buffer strip soil is not phosphorus saturated (even after over 50 years) and can continue to prevent runoff to the river water.

*"Effectiveness of vegetated buffer strips in controlling legacy phosphorus exports from agricultural land", R. Habibiandehkordi et al., J. Environmental Quality 2018 <http://dx.doi.org/10.2134/jeq2018.04.0129>*

### Austrian expert report on sewage and animal by-product phosphorus recycling



A [report](#) by the Austrian Water and Waste Federation, prepared by a group of 19 experts, led by Lukas Egle of Vienna City MA48, assesses the potential for phosphorus (P) recovery from municipal sewage and from animal by-products (ABPs) in Austria, legal and organisation context, and summarises different technological routes currently available. Sewage and ABPs in Austria are estimated to contain 0.85 and 0.45 kgP/year respectively (of which 0.1 kgP/y in Cat1. ABPs), that is in total around 80% of Austria's mineral phosphorus fertiliser consumption.

About 60% of Austria's sewage goes to 39 sewage works of capacity > 100 000 p.e. and the 197 largest works treat 85% of Austria's sewage. Nearly half of Austria's sewage phosphorus is currently recycled to land, mostly after composting or similar, but the expert group expects this proportion to decrease because of concerns about possible risks. The experts consider that the best option for phosphorus recovery is mono-incineration of sewage sludge (incinerators taking only sewage sludge as input, not mixed with municipal solid waste, not cement industry) combined with technical recovery of phosphorus from the ash. Together, this is estimated to add +5% to total municipal wastewater collection and treatment costs. The experts note that for ABPs, Cat. 3 MBM (meat and bone meal) should preferably be recycled to animal feed, Cat. 2 MBM is not produced in Austria, and Cat. 1 materials must be incinerated to ensure safety. They suggest coupling between sewage sludge and ABP incineration to optimise costs. Proposed actions include further investigation into potential of P-recovery from ABPs, scenarios for P-recovery from sewage works of different sizes and definition of best practices for recovery of high-value phosphorus products.

ÖWAV (Österreichischer Wasser- und Abfallwirtschaftsverbandes) *ExpertInnenpapier "Kritische Ressource Phosphor. Wiederherstellung unterbrochener Phosphor-Kreisläufe durch Nutzung der vorhandenen Phosphor-Quellen: Kommunales Abwasser und tierische Nebenprodukte – Aktuelle Hinderungsgründe und Lösungskonzepte"*, November 2018 [www.oewav.at/Publikationen?current=326093](http://www.oewav.at/Publikationen?current=326093)

### Suez Phosgreen struvite recovery, Mulhouse, France

The local cities' authority Mulhouse Alsace Agglomération and Suez have [started](#) construction of energy and resource recovery installations for the Sausheim sewage works, which serves nearly 300 000 people. This will include struvite recovery (Phosgreen process) and anaerobic digestion of the sewage sludge, planned to produce 80 tonnes of struvite and 2 million m<sup>3</sup> of biogas per year. The bio-methane will be injected into the natural gas network. The digestate will be dewatered by centrifuge and then incinerated.

*"SUEZ accompagne le SIVOM de la region Mulhousienne dans sa transition énergétique"*, 12 November 2018 [www.suez.com/fr/Actualites/Communiqués-de-presse/SUEZ-accompagne-Sausheim-avec-unite-methanisation](http://www.suez.com/fr/Actualites/Communiqués-de-presse/SUEZ-accompagne-Sausheim-avec-unite-methanisation)

### New methods for real-time analysis of crop phosphorus need



New agricultural techniques based on chlorophyll fluorescence are being tested to assess crop phosphorus status in the field, and so adjust phosphorus fertiliser application. When lacking phosphorus, plants will initially maintain cell cytoplasm levels of inorganic phosphorus, but reduce levels of phosphorus stored in vacuoles and substitute phospholipids in membranes. Plant morphology changes include changed root morphology and reduced shoot development (tillering, which is a key

factor for cereal crop yield). Changes in chlorophyll- $\alpha$  (chl- $\alpha$ ) fluorescence can indicate phosphorus shortage before such detrimental crop changes occur. In healthy plants, 80% of light energy absorbed by chl- $\alpha$  is transferred into the biochemical pathway, 1-3% is re-emitted as fluorescence and the rest is dissipated as heat. The time-pattern of fluorescence (over the milliseconds after light exposure) is modified by different aspects of plant health, such as leaf age, CO<sub>2</sub>, pollution, plant diseases and nutrient deficiencies. Frydenvang (2015) showed (using barley) that the pattern of fluorescence emission from a leaf from 0.1 milliseconds to 1 second after controlled light exposure is specifically modified under phosphorus deprivation ("OJIP" curve). Key information for phosphorus status is the percentage of biochemical light conversion (photosynthetic efficiency), baseline fluorescence, I-phase of OJIP curve and time to maximum fluorescence. Unfortunately, this requires that the leaf is first dark-conditioned for around half an hour. A portable device has been developed to do this, including leaf clips which ensure darkness



(25 minutes), a hand-held device which fits the clips and provides controlled LED light into the clip and measures the fluorescence release pattern (over 3 seconds), and an app which analyses the information and transfers to GPS-linked smartphone (SpectraCrop [www.spectracrop.com](http://www.spectracrop.com)). This can thus give measurements of plant phosphorus status, in the field, within half an hour, easily multipliable in different sites in the field (using a number of leaf clips). This system has been tested on maize, tomato, wheat, and soy bean and because measurement is of the electron transport chain in photosynthesis, which is conserved across plant species, the approach is expected to be valid for most crop species. Device development is still underway and units are only available for controlled testing, currently at 5 000 € ex-VAT.

*"Developments in the use of chlorophyll a fluorescence to diagnose phosphorus deficiency in plants"*, A. Carstensen & S. Husted, IFS Proceedings 811, 2017 ISBN 978-0-85310-448-3 [www.fertiliser-society.org/publications.aspx](http://www.fertiliser-society.org/publications.aspx)

*"Sensitive Detection of Phosphorus Deficiency in Plants Using Chlorophyll a Fluorescence"*, J. Frydenvang et al., Plant Physiology, September 2015, Vol. 169, pp. 353–361 <http://dx.doi.org/10.1104/pp.15.00823>

*"The Impacts of Phosphorus Deficiency on the Photosynthetic Electron Transport Chain"*, A. Carstensen et al., Plant Physiology, May 2018, Vol. 177, pp. 271–284 DOI: <https://doi.org/10.1104/pp.17.01624>

*"Chlorophyll a fluorescence analysis can detect phosphorus deficiency under field conditions and is an effective tool to prevent grain yield reductions in spring barley (Hordeum vulgare L.)"*, A. Carstensen et al., Plant Soil 2018 <https://doi.org/10.1007/s11104-018-3783-6>  
SpectraCrop [www.spectracrop.com](http://www.spectracrop.com)

## Natural iron minerals tested as constructed wetlands substrate

Pyrite (iron disulphide FeS<sub>2</sub>), a naturally occurring or manufactured mineral, as a substrate for constructed reedbed wetlands (*Phragmites australis*), was **tested** for nitrogen (N) and phosphorus (P) removal. 3 m<sup>2</sup> systems for 3 years, using river water spiked with nitrate and phosphate: influent COD 10 – 70 mg/l, NH<sub>4</sub>-N 5-7 mg/l, total-N 10-20 mg/l, total-P 2-6 mg/l. Hydraulic residence time was 72 hours. Total phosphorus removal was nearly 90%, with residual discharge around 0.25 mgP/l, and total N removal around 70% with discharge c. 4 mgN/l. COD removal was around 50%, possibly low because river water COD is more stable than wastewater COD. A limestone substrate system tested in parallel showed reasonable P-removal for the first year (c. 60%) but near zero removal after that, because the limestone phosphorus adsorption capacity was saturated. Pyrite had no negative impact on reed growth compared to the limestone substrate. The main P forms in the pyrite after operation were iron and aluminium compounds. The authors also present analysis of the bacteria present in the pyrite wetland substrate. They conclude that pyrite provides an effective reedbed substrate for water treatment, compatible with COD removal and reed growth, and enabling both nitrogen and phosphorus removal over prolonged operating periods.

*"Natural Pyrite to Enhance Simultaneous Long-term Nitrogen and Phosphorus Removal in Constructed Wetland: Three Years of Pilot Study"*, Z. Ge et al., Water Research (2018) <https://doi.org/10.1016/j.watres.2018.10.037>

## EU science advisory committee report on microplastics



A scientific consortium contracted by the European Commission, as part of the EU Scientific Advisory Mechanism, has published an [Evidence Review Report](#) on microplastics, concluding that "little is known about" microplastics in soils (sources, risks), but that sewage biosolids recycling to agriculture may be a significant source. Overall, for all environmental compartments (water, water sediments, soils ...), the report concludes that "ecological risks

are very rare at present" (with possible risks in some locations in coastal waters and sediments). It also concludes "no evidence of widespread risk to human health" at present, noting that microplastics go "in and out of" most organisms. The report suggests that if emissions of microplastics are not reduced then ecological risks "may be widespread within a century". Concerning soils, the report notes that analysis techniques are lacking and that there is very little data on impacts on soil organisms, on crop yield (including via impacts on soil properties), nor on the food chain, and so that further research is needed.

*"A scientific perspective on micro-plastics"*, Science Advice for Policy by European Academies (SAPEA), January 2019, ISBN 978-3-9820301-0-4 [www.sapea.info/topics/microplastics](http://www.sapea.info/topics/microplastics)

## Nutrient use efficiency identified as agricultural research priority

The US National Academy of Sciences, Engineering and Medicine [Consensus Report](#) on science breakthroughs to advance food and agriculture places "Increasing nutrient use efficiency in crop production systems" at the top of the list of nine key research challenges. Other challenges identified are: reducing soil loss and degradation, crop genetic diversity and livestock genetics, water use, precision livestock production, prevention of plant and animal diseases, foodborne pathogens and reducing food loss and food waste. Opportunities identified are: transdisciplinary research approach, in-field sensors and bio-sensors, understanding soil microbiome and livestock micro-organism biomes (including their roles in nutrient cycling). The need for applied research, cooperation with agricultural advisory services, with industry and with stakeholders and policy makers is emphasised. Research areas proposed to improve nutrient use efficiency are: sensing technologies, data analytics, crop breeding, land management and better understanding the soil microbiome's ability to fix nitrogen and to improve nutrient availability.

*"Science Breakthroughs to Advance Food and Agricultural Research by 2030"*, US National Academies Press – Consensus Study Report, 2018, 200 pages, ISBN 978-0-309-47392-7 <https://doi.org/10.17226/25059>

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