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ESPP working meeting

Pharmaceuticals in sewage biosolids, 27/10/2016

ESPP is organising a workshop on "**Pharmaceuticals and organic chemicals in sewage biosolids: questions for recycling**", Malmö (near Copenhagen) 27th October 8h00 – 12h00, in cooperation with the [Nordic Phosphorus Conference](#), 27th October (12h00) – 28th 13h30 (same venue). The workshop will look at which pharmaceuticals and organic consumer chemicals are found in sewage biosolids, at what concentrations, effects of composting, anaerobic digestion, whether there is a risk to health and the environment when treated biosolids are used in agriculture, how levels can be reduced and what further data and research is needed. If you are interested in presenting (speaker or poster) please contact info@phosphorusplatform.eu with a short summary of your proposed presentation.

Nordic Phosphorus Conference, 27th October (12h00) – 28th 13h30 <https://dakofa.com/conference/conference/> and ESPP pharmaceuticals in sewage biosolids workshop 27th October 8h00 – 12h00 info@phosphorusplatform.eu

New ESPP member

Fraunhofer IGB new ESPP member

[Fraunhofer IGB](#) develops and optimizes processes and products for the business areas of medicine, pharmacy, chemistry, the environment and energy. One of the key research areas of Fraunhofer IGB is the development and implementation of cost-efficient strategies and technologies for the integrated management of nutrients from wastewater and organic waste. In recent years, innovative technologies have been developed and demonstrated at laboratory, pilot and industrial scale to recover mineral fertilizers and soil improvers from

municipal sewage sludge, livestock manure, digestate from biogas plants and food industry residues. This includes the chemical-free process ePHOS® (presented at IFAT 2016) for phosphorus recovery from sewage sludge and BioEcoSIM for manure valorization. Fraunhofer IGB believes that ESPP offers us a great opportunity to connect with new stakeholders, to strengthen existing partnerships, and help us promote sustainable phosphorus management at the European level. <http://www.igb.fraunhofer.de>



Success stories

Maabjerg biorefinery

[Maabjerg biogas plant](#), near Holstebro, Denmark, treats 725 000 t/y animal manures, food industry byproducts, abattoir wastes, sewage biosolids and industry flotation sludge, producing biogas for electricity production and district heating. The manure, food industry and abattoir materials are treated separately, producing 550 000 t/y of liquid 'Green Line' liquid digestate and 40 000 t/y fibres, both of which are recycled as fertilisers. A double piping system enables collection of slurry and distribution of liquid digestate with reduced road transport. The biogas plant is estimated to reduce environmental P and N losses by 300 t/y and to maintain 300 local jobs in farming and food processing.

IEA BioEnergy Task 37 [Case Study](#), Denmark "Maabjerg Biogas Plant: Operation of a very large scale biogas plant in Denmark, June 2014"

REVAQ sewage certification: biosolids recycling quality

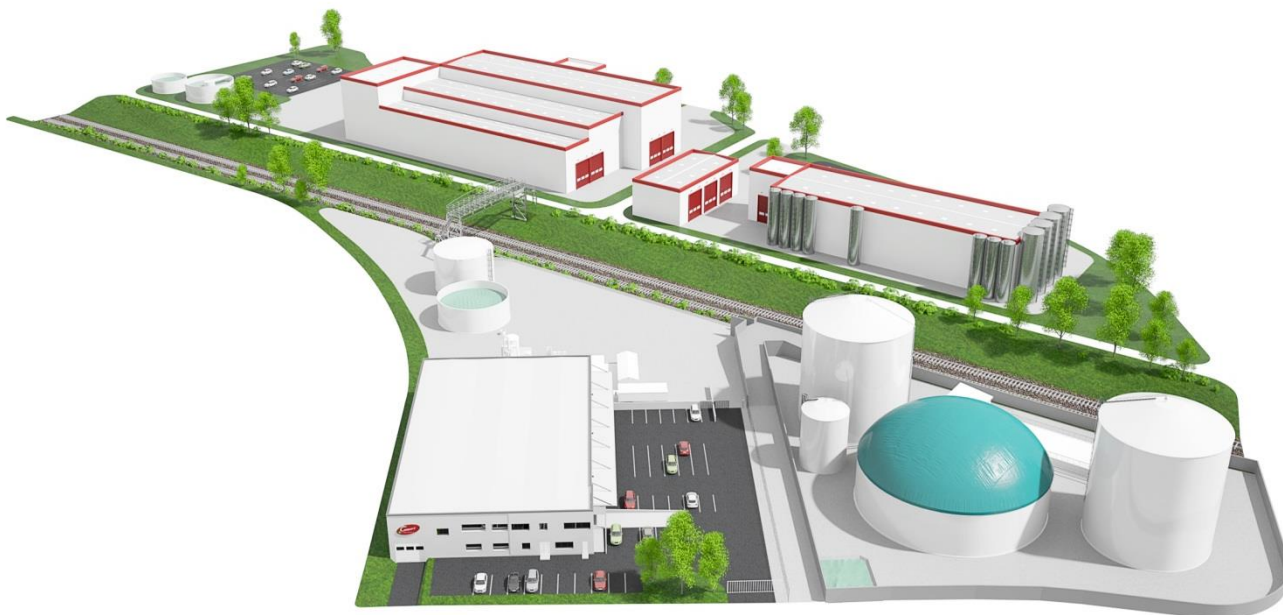
Today over 50% of Sweden's population is connected to REVAQ certified sewage treatment plants, ensuring continuous quality monitoring of incoming wastewater, sludge digestate quality requirements and transparent information about treatment methods and digestate quality, including traceability of biosolids origins and treatment dates. A key driver of the launch of the REVAQ Certification system in 2008 was the objective to ensure recycling of sewage biosolids phosphorus, nitrogen, micronutrients and organic matter back to agriculture, to provide nutrients and improve soil quality. In 2003, REVAQ Certified digestate contained nearly 3 000 t/y of phosphorus, of which nearly 50% was used in agriculture. REVAQ fixes upstream objectives for source reduction of pollutants, for example aiming to reduce cadmium to ≤ 17 mgCd/kgP by 2025 (see SCOPE Newsletter [n°117](#) cadmium in artists paints). REVAQ is also working with upstream industries to reduce silver, gold, mercury and organic contaminants in sewage.

IEA BioEnergy Task 37 [Case Study](#) "REVAQ Certified WWTP"

Cooperl Emeraude-Energy launched

Farmers' cooperative Cooperl has announced investment in a 150 000 t/y input biogas plant, Emeraude-Energy, in Lamballe, Northern Brittany, France. The plant will methanise pig manure and slaughterhouse wastes, producing 79 000 MWh/y equivalent methane, which will be injected into the local natural gas distribution network. Around 610 t/y of phosphorus and 500 t/y of nitrogen in the digestates will be recycled in granulated, nutrient-adjusted organic fertiliser products (production capacity 80 000 t/y). Cooperl already produces such organic fertiliser products from treated manure, adapted to different crops and supplied to France's agricultural regions which need nutrient inputs for crops such as vineyards, sunflowers, colza, maize. Several hundred thousand tonnes of poultry and pig manures are already processed to fertilisers in Brittany, see SCOPE Newsletter [n° 111](#).

Emeraude Bio-Energie <http://emeraude-bio-energie.fr/le-projet-emeraude-bio-energie/>



PHORWater final conference

The [LIFE+ PHORWater](#) project final conference in Madrid, 14th July 2016, presented DAM (Depuración de Aguas del Mediterráneo) success operating a 20 m³/day struvite recovery stirred reactor, designed by LAGEP Lyon, at Calahorra, Rioja, sewage treatment works. The project showed that struvite recovery and nuisance deposit avoidance can be optimised by mixing different sludge/digestate flows, which can also reduce chemical consumption by changing the reactor inflow pH. Field tests of the recovered phosphate are underway on potatoes and wheat in Spain. Bibiana Rodriguez, Magrama (Span Agriculture, Food and Environment Ministry) indicated that to authorise struvite as a fertiliser in Spain, either the EU Fertiliser Regulation revision process could ensure this, or field test data from Spain are needed to show fertiliser efficiency, as well as data showing safety and product analytical methods, in order to enable struvite to obtain end-of-waste status and be listed as an acceptable waste material for use on soils. The [ReVaWaste](#) LIFE+ project (Valladolid, Spain) was presented (energy, organic carbon and struvite recovery from different organic wastes). The slides of the PHORWater conferences online now include presentations of experience by leading struvite recovery technology suppliers who participated, in addition to PHORWater: NuReSys, Veolia (Struvia), Suez (Phosphogreen), Naskeo and (see [Amersfoort LIFE+](#)) Ostara (CrystalGreen). <http://phorwater.eu/en/>





Ductor biogas & nutrient recovery from chicken manures

Ductor Corp., Finland, has [announced](#) its first commercial installation in Germany, at Haren (Emsland, Lower Saxony), designed to replace maize silage in biogas production (expensive and competes with food production) by chicken manure, with ammonia removal and recovery (as ammonia or ammonia sulphate). The Ductor fermentation system removes ammonia upstream of the anaerobic digester, so enabling biogas production from high N manures. The Haren unit, realised jointly with Rücken and Partner Group (R&P), is planned to treat 10 000 tonnes/year of chicken manure and recover 350 tN/year. The digestate can be neutralised with potassium hydroxide to produce a P-K fertiliser. Ductor was [awarded](#) GCCA (Global Cleantech Cluster Association) Top 10 in 2015. See [here](#) to attend the plant inauguration 30th September 2016. www.ductor.com



Policy

EU exceeds international ammonia emissions limit

In 2014, the EU exceeded for the first time its ammonia emissions (NH₃) limit fixed under the Gothenberg Protocol to the UNECE Long-Range Transboundary Air Pollution Convention (LRTAP). Germany, Finland, Spain and the Netherlands also exceeded their individual ammonia emissions ceilings (by 35%, 14%, 5% and 5%). EU ammonia emissions increased by 0.9% from 2013 to 2014. The European Environment Agency indicates that 94% of EU ammonia emissions come from agriculture. This EU failure to respect its international obligations can be expected to progressively put pressure, via future revisions of the National Emission Ceilings Directive (NEC), to prevent ammonia emissions in manure storage, treatment and spreading, and so provide a driver for nitrogen recovery and recycling.

European Environment Agency (EEA) Technical Report 16/2016 [European Union emission inventory report 1990–2014 under the UNECE Convention on Long-range Transboundary Air Pollution \(LRTAP\)](#)

EU EIP Raw Materials publishes first “Raw Materials Scoreboard”

The EU funded EIP Raw Materials (European Innovation Partnership) has published a 108 page [“Raw Materials Scoreboard”](#). Phosphate rock, despite being on the EU Critical Raw Materials list since 2014, is only mentioned five times (plus two mentions to specify that phosphate rock was not covered). Phosphors (as used in lights, LEDs ...) are mentioned but these should not be confused, they are based on different metals and not phosphorus. Phosphate rock world production is shown to be 70% concentrated in China, USA and Mongolia (Mongolia produces “phosphor” metals, for phosphate rock it should read: Morocco), which is conform to USGS data, but does not take into account the possibly higher geopolitical concentration of reserves. Phosphate rock is indicated to have only 10-20% “End of Life Recycling Input Rates” EOL-RIR), which is supposed to indicate the percentage of total material input into production coming from recycling. This is misleading: it may be based on the methodology of the Deloitte MSA report published 2/2016 (see [SCOPE Newsletter n° 119](#) “incorrect and un-useable results”). In reality, nearly 1 800 ktP/y are recycled back to fields as fertiliser from manure, plus around 150 ktP/y from sewage sludge, food wastes and meat and bone meal ash, compared to total net EU consumption (import – export) of around 2 050 ktP/y.

European Innovation Partnership on Raw Materials Raw Materials Scoreboard 2016, [ET-02-15-541-EN-N](#)

“Soil organic matter matters”

The European Commission's EIP-AGRI has published an 8-page brochure promoting soil organic carbon “[Soil organic matter matters](#)”. This is published by EIP-AGRI following the Focus Groups on ‘Soil Organic Matter content in Mediterranean regions’ and ‘Soil-borne diseases’. It outlines the importance and long-term benefits of organic matter in soil, including nutrient capacity, water retention and drought resistance, reducing soil erosion, soil biological functionality and carbon capture (greenhouse emission mitigation). Scientific data sources and online toolboxes to help farmers restore soil quality are listed. Field cases cite compost and manure application as important routes for improving soil organic matter. The brochure proposes a number of themes for Operational Groups identified by the two Focus Groups. EIP-AGRI <https://ec.europa.eu/eip/agriculture/>

ESPP joins FAO Technical Advisory Group on Nutrient Cycles Accounting

The Food and Agricultural Organization (UN FAO) launched a Technical Advisory Group (TAG) on Nutrient Cycles Accounting and Impact Assessment ([Nutrient TAG](#)) within the Livestock Environmental Assessment and Performance (LEAP) Partnership. ESPP has been selected as a [member](#). The LEAP Partnership members called for recommendations on nutrient accounting and impact assessment, for inclusion into the LEAP guidelines. The TAG will build a global common ground by technical dialogue between relevant scientific communities, practitioners, and LEAP stakeholders. Guidance from the Nutrient TAG will concern livestock supply chains including feed production from croplands and grasslands, production and processing of livestock products. During the first advisory group meeting held at FAO headquarters in Rome, 12 – 14 July, stakeholders discussed the objectives, frameworks and specific issues related to nutrient flow analysis, impact assessment, life cycle analysis and foot printing. ESPP provided a presentation on the need for better Data on Nutrients to Support Stewardship, based on conclusions of the DONUTSS workshop 201, see [slides](#).

FAO Nutrient TAG <http://www.fao.org/partnerships/leap/en>

Funding opportunities and calls

Alternative nutrient sources for organic farming

Call for Research & Innovation Action to “find alternatives” to contentious input products used in organic farming. Manure from non-organic farming is cited as such an input. Phosphate rock is not cited, but could maybe also be considered. Objectives include accessible and cost-effective alternatives, improved knowledge of their use, enabling enhanced organic farm productivity and reduced environmental impact. Also is currently open a second call for Thematic Networks to disseminate agricultural research results to practitioners.

Horizon 2020 - [SFS-o8-2017](#) - “Organic inputs – contentious inputs in organic farming”. Deadline (stage 1) **14/2/2017**. Budget 8 M€.

Horizon 2020 - [RUR-10-2016-2017](#) – “Thematic Networks compiling knowledge ready for practice”. Deadline **14/2/2017**. Budget 10 M€.

Everglades Foundation US\$10M phosphorus removal & recovery prize now open

The Everglades Foundation George Barley prize (total prizes 11.3 million US\$) for solutions to remove nutrients from surface waters is now officially launched, with three cut-off dates for stage 1 submissions (**31st August, 31st October and 31st December 2016**). Final judging [criteria](#) are: land use footprint (impervious and total), cost (investment and operating), phosphorus removal from river waters (final objective: treatment of 0 – 15 million litres/day down to 10 – 15 ppb total P including in cold climates), environmental sustainability (impact on treated water chemistry and biota, waste disposal, value-added or recovered by-products – that is P-recycling), scalability, income from by-products (P-recycling). NOTE: entrants should verify the judging criteria for Stage 1 which are defined differently. Submission for Stage 1 requires answering seven questions online (short paragraphs): summary, total P inflow and outflow concentrations, upscaling, costs and investment potential, innovation and originality, inspiration. The entry must also include “A written report detailing the experiment design and environmental impact assessment” (upload file) – for which the template is available [here](#) and must include a <2 minute videos (see Stage 1 [instructions](#)). A specific “Phoenix” prize of 170 000 US\$ will go to the project showing the best potential for by-products.

George Barley Water Prize and Phoenix Prize, submission deadlines 31st August, 31st October and 31st December 2016
www.barleyprize.com

European Network for Rural Development – resource efficiency

ENRD (European Network for Rural Development, funded by the European Commission DG Agriculture) is [calling](#) for participants for a Thematic Group on “Resource efficient rural economy”. Deadline for candidates **27th August 2016**.

Call for candidates https://www.surveymonkey.com/r/TG_Resource-Efficiency Information: www.phosphorusplatform.eu under Downloads

Science and media

UK research shows crop value of digestate and compost

Field tests of 3-5 years at 22 UK locations show that food-waste digestate provides plant-available nitrogen, increasing crop yields and that compost from garden green waste / food waste builds soil organic matter more rapidly than manure. Both products also provide phosphorus, potassium and sulphur to crops. The WRAP "DC-Agri" research [summary](#) (Feb. 2016) indicates total nutrients in this digestate as 0.5%N (80% readily available), 0.05%-P₂O₅ and 0.02%K-K₂O. The summary provides analysis of crop yields, crop quality, soil organic matter, soil biology and physical properties, soil contaminants, ammonia emissions, greenhouse gases and leaching of P and N. The report underlines the need to respect good practice in application of all organic recycled nutrient materials (composts, digestates, manures) and indications are provided in the WRAP [Guides to Good Practice](#) UK DEFRA (ministry for environment, farming and rural affairs) [welcomed the report](#) for sustainable farming and renewable fertiliser "helping farmers to grow crops more smartly and efficiently".

"Field experiments for quality digestate and compost in agriculture". [DC-AGRI report](#), Feb. 2016

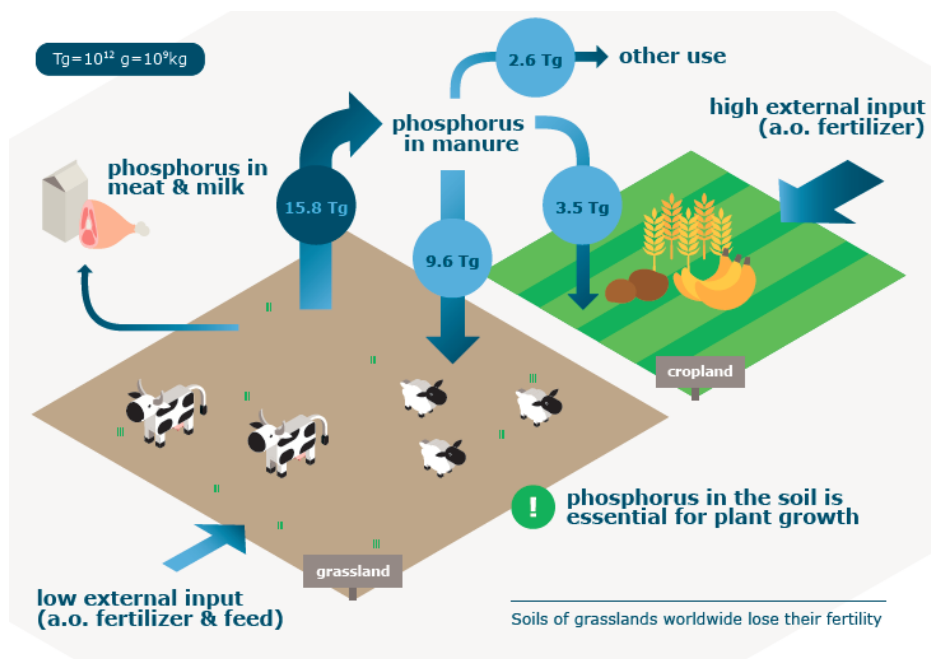
Biowaste collection and recycling could mean 90 000 jobs in Europe and save money

The European Compost Network (ECN) estimates that the processing to recover energy and materials of Europe's nearly 100 million tonnes/year of biowastes (40% of total wastes) could generate over 90 000 jobs (of which 70 000 in rural areas). Of these jobs, around one third exist already today, and processing the two-thirds of biowastes which are currently not recycled or used would thus generate 60 000 new full-time employment equivalents: see the ECN [infographic](#) July 2016. Further, a study by EUNOMIA in the UK suggests that separate collection of food wastes (which makes up 30% of domestic refuse in the UK) would save 12-25€ per household through reduced refuse collection frequency. Businesses producing 1 tonne of food waste per week could save over 2 200 € per year if mandatory collection were implemented.

"The Real Economic Benefit of Separate Biowaste Collections. A business case" EUNOMIA, Olleco, REA [May 2016](#)

Phosphorus offtake threatens sustainability of grasslands

Nearly 40% of livestock manure was exported away from the world's grasslands over 1970 – 2005, removing P and N and threatening grasslands fertility, according to a study published in Nature and based on FAOSTAT data. The world's grassland area is >3 billion hectares, twice the cropland area. Soil P removed from grassland must be replaced by organic and mineral fertiliser inputs. The authors estimate that to support an 80% increase in grass production, for milk and meat, these inputs will have to increase four-fold from 2005 to 2050. Combined with requirements for cropland, they estimate that mineral P fertiliser use must double by 2050 (to 1 200 million tonnes P). They emphasise that a range of nutrient management strategies will be needed to meet this challenge, including manure reuse, reducing food losses, returning nutrients from other organic wastes to land, balanced P fertilisation as well as mineral fertiliser use.



"Negative global phosphorus budgets challenge sustainable intensification of grasslands", Sattari et al., Nature Communications 2016 <http://dx.doi.org/10.1038/ncomms10696> Open Access

Where there's swill there's a way

Food waste is currently banned from use in animal feed in the EU (and in some 18 US states), following the Foot and Mouth Disease outbreak transmitted by illegal feeding of uncooked food waste to UK pigs in 2001 (incident which cost the UK around 10 billion €). Japan and Korea, on the other hand, feed 40% of their food waste to pigs after cooking under specific sanitising conditions (70 or 80°C), as does China. A recent study from Cambridge University UK estimates that similar, safe, food waste recycling in the EU could reduce land use of EU pork production by one fifth, i.e. 8 million hectares (half the area of Switzerland), including saving half a million hectares of Brazil soybean. Swill feeding to pigs is also analysed as reducing other environmental impacts (green house emissions, eutrophication), improving farmers' profitability and improving pork meat quality.

"Reducing the land use of EU pork production: where there's swill, there's a way", E. zu Ermgassen, B. Phalan, R. Green, A. Balmford, Food Policy 58, 2016, 35-48 <http://dx.doi.org/10.1016/j.foodpol.2015.11.001> Open Access

Scientists propose fertiliser tax to balance biodiesel environmental impacts

The EU's 'Science for Environment Policy' has published a summary of study by INRA France suggesting that The paper is based on results of monitoring of 600 farms in the Meuse (Northern France) and economic modelling. The price of "fertilisers" is taken as a variable, without distinguishing between phosphorus, nitrogen or other inputs. Demand for fertilisers (in this region) is modelled as expected to increase by 2 – 8% to 2020, driven by increasing prices for colza (rapeseed) resulting from EU biofuels policy. A tax of 50 – 270 €/tonne on fertilisers (not specified which fertilisers) is simulated as appropriate to balance this increase in demand and mitigate possible environmental impacts. The authors note that the French government announced an increase in VAT on fertilisers in 2013, but that this has never been implemented.

"The impact of high crop prices on the use of agro-chemical inputs in France: A structural econometric" Bayramoglu et al., Land Use Policy 55:204-211, 2016 <http://dx.doi.org/10.1016/j.landusepol.2016.03.027> and European Commission Science for Environment Policy 15/7/2016 "Fertiliser tax of €0.05–0.27 per kilogram calculated for France as incentive to limit its use"

HTC technology update and AVA Cleanphos pilot

The EU 7th FP NEWAPP [project](#) (New technological applications for wet biomass waste stream products) has published an 80 page report summarising state-of-the-art of HTC (hydrothermal carbonisation) for conversion of wet biomass wastes to quality carbonaceous products which can be used in metal smelting, water and gas purification (pollutant absorption), animal feed additives or soil improvers. Also, the University of Hohenheim, Fraunhofer ISC (Institute of Silicate Research) and AVA-CO₂ have [started testing](#) in Karlsruhe, Germany, a pilot plant for P-recovery from sewage sludge. The process combines HTC (hydro thermal carbonisation) pyrolysis, producing a coke-type fuel ("HTC-coal"), acid leaching of phosphorus, nano-filtration, membrane filtration and concentration to generate phosphoric acid, calcium phosphate or struvite. The company's presentation indicates that the phosphorus is not classified as can be the case in incineration ash so that the acid leaching requires less chemicals and energy, and that most of the heavy metal contaminants remain in the "coal". AVA's Karlsruhe demonstration HTC unit has a capacity of 14 000 litres. www.ava-co2.com

EFSA say phosphonate is safe for food contact use

EFSA (European Food Safety Agency) has published [13th July](#) an evaluation of the phosphonate [[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]methyl]phosphonate. This organophosphorus chemical is used as a polymerisation additive in PET plastics (poly(ethyleneterephthalate)). EFSA concludes that it is safe for use in contact with food (FCM = food contact material) in this application. The evaluation indicates that no migration out of the plastic was detectable, that tests show no genotoxicity.

"Phosphorus from wastewater to crops: An alternative path involving microalgae", Biotechnology Advances 2016

Phosphorus recycling by micro-algae growth

A review paper presents the state-of-the-art and knowledge gaps for the use of waste streams to feed micro-algae production. The algae can then be used either to extract chemical products (e.g. polyphosphates) or bio-fuels, or for use as fertilisers. P-uptake by algal cells is an active transport system, because the negative phosphate ion does not passively cross the lipid cell membrane which has a negatively charged inside surface. Phosphorus intake and storage occurs naturally in algae, e.g. species which vertically migrate in lakes to use the P-rich deeper waters and surface light. Selection of algae to accentuate fast growth and high P storage are discussed. Different growth technologies are presented: open ponds, photo-suspension bioreactors, immobilised micro-algae, thin layer systems. Further research is needed on these areas, and on selection of micro-algae to optimise their value as fertilisers, including interactions with soil micro-biology.

"Phosphorus from wastewater to crops: An alternative path involving microalgae", Solovchenko et al., Biotechnology Advances 2016

Events

- ❖ 16-20 Aug, Kunming, Yunnan, China, 6th **Sustainable Phosphorus Summit** <http://sps.ythic.com/>
- ❖ 5-9 Sep, Lake District, UK, Germany, **International Organic Phosphorus Workshop** www.soilpforum.com
- ❖ 8-9 Sep, Varna, Black Sea, Bulgaria, **EcoPhos Technophos factory site visit**, new process now operational for P-recovery from ash and from low grade rock www.technophos-grandopening.com
- ❖ 12-16 Sept, Rostock, Germany, 8th **International Phosphorus Workshop (IPW8)** www.wissenschaftscampus-rostock.de
- ❖ 13 Sept. Brittany France, COOPERL international workshop on pig manure treatment and nutrient management - further details pending. With visit to SPACE International Livestock Trade Fair www.space.fr
- ❖ 27 Sept. London, CIWEM conference **New Developments in Sustainable Phosphorus Management: Taking the P out of Pollution** www.ciwem.org/events/new-developments-in-sustainable-phosphorus-management-taking-the-p-out-of-pollution
- ❖ 28-29 Sept. Vejle (near Billund) Denmark, Denmark EPA International Seminar on Slurry Acidification www.conferencemanager.dk/acidification
- ❖ 11-12 October, Manchester UK, European Waste Water Management Conference (EWM) <http://ewmconference.com/>
- ❖ 27-28 October, Malmö near Copenhagen, Nordic Phosphorus Conference <https://dakofa.com/conference/conference>
- ❖ 11 November, Berlin, DPP Forum on nutrient recovery from manure and sewage in Europe www.deutsche-phosphor-plattform.de
- ❖ 15-16 November, Edinburgh, Scotland, European Biosolids Conference <http://european-biosolids.com/>
- ❖ 24 November, Circular Economy in Agriculture, Paris <http://agriculture-circulaire.jimdo.com/programme>
- ❖ 13-15 March 2017, Tampa, Florida, Phosphates 2017 www.crugroup.com/events/phosphates
- ❖ 21-23 June 2017, Belfast, P sustainability for Ireland and microbial processes for P-removal

Registration information and full events listing:
<http://www.phosphorusplatform.eu/events/upcoming-events>

ESPP Members

