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Upcoming events

Workshop Waste water phosphorus removal tomorrow: ambitions and reality



9th October, Liège, near Brussels. 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 RTD), 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**. Programme, registration and more information can be found at www.phosphorusplatform.eu/Premovalworkshop

In partnership with / supported by: IWA (the International Water Association), Eureau, CIWEM (Chartered Institution of Water and Environmental Management), Université de Liège and ECSM'19 (European Conference on Sludge Management), Liège 6-8 October 2019, for information on the phosphorus removal workshop, website www.phosphorusplatform.eu/Premovalworkshop and contact info@phosphorusplatform.eu

9th International Phosphorus Workshop (IPW9)



"Putting phosphorus first? How to address current and future challenges". ETH, Zurich, Switzerland, 8-12 July 2019. The 9th International Phosphorus Workshop (IPW9) will address five research themes: 1. phosphorus scarcity; 2. optimizing regional and national phosphorus cycles; 3. sourcing phosphorus fertilizers; 4. efficient phosphorus use in agroecosystems; 5. environmental phosphorus problems.

Website IPW9 www.ipw9.ethz.ch

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

Conference and meeting outcomes

Successful first workshop of the carbon-based fertiliser industry



The first **Summit of the Organic Fertiliser Industry** in Europe (**SOFIE**, 5-6 June 2019, Brussels) brought together, for the first time ever, the European carbon-based fertiliser sector, and attracted over 125 participants, from industry (two thirds of participants), regulators, stakeholders and R&D, covering 14 European countries, as well as India and North America. The workshop addressed industry and markets for added-value organic fertiliser products, agronomic evidence of carbon-based fertilisers impacts on crops and on soils, and opportunities and challenges for industry from developments in European regulations. Discussions underlined that organic and mineral fertilisers are

complementary products and confirmed the need to deliver consistent and quality products to farmers, adapted to agronomic requirements and to practical considerations. Market opportunities identified include the development of Certified Organic Farming (an added-value market for appropriately produced carbon-based fertilisers), links to innovative bio-stimulant products, increasing recognition of the importance of soil organic carbon and development of the circular economy for nutrients and carbon. These markets will be considerably changed by the new EU Fertilising Products Regulation which will enable export within Europe (new CE-Mark opening a 'single' EU market).

SOFIE was organised by ESPP in partnership with the International Fertiliser Society (IFS). Meeting slides are online here and a full conference conclusions and summary (SCOPE Newsletter N°130) will be published shortly www.phosphorusplatform.eu/SOFIE2019

1st workshop on EU Fertilising Products Regulation implementation



Fertilizers Europe organised on 28th May the first meeting to present implementation of the new EU Fertilising Products Regulation (FPR). Speakers included the European Commission, national regulators, CEN industry and scientific experts. Kirsi Ekroth-Manssila, Head of Unit Chemicals at DG GROW, summarised the changes the FPR will bring for fertiliser producers, technology providers, farmers and for environmental protection. She outlined tasks now outstanding for FPR implementation: setting-up conformity assessment (notified bodies) and market surveillance, defining criteria on agronomic efficiency and safety for by-products, defining criteria for biodegradation of polymers in control release fertilisers, new European testing standards, guidance on labelling, FRP "FAQs" document. Andreas Steinbüchler, Borealis, presented the company's work

with the City of Vienna to recycle back to mineral fertilisers phosphorus from the city's sewage sludge incineration ash. He outlined Borealis' expectations in and beyond the FRP: coherent implementation across EU Member States, clear and workable criteria for by-products, an EU label for recycled nutrient fertilisers and assessment of fertilising products' Nutrient Use Efficiency (NUE). Patrick du Jardin, Gembloux Agro-Bio Tech, Université de Liège, presented the potential of biostimulants in improving fertiliser Nutrient Use Efficiency, underlining that the opportunities offered by their inclusion in the FRP. Yan Chys, Yara and convener of CEN TC 260 / WG7 summarised the need for EU standards for testing methods to accompany the FPR and the considerable challenges: number of new standards needed, scope beyond simple analytical methods (sampling; safety; additive specific; performance oriented; environmental), time needed for stakeholder consultation, ring testing and in some cases field trials.

"New Fertilizer Regulation: Where do we go?", Fertilizers Europe workshop, Brussels, 28th May 2019 www.fertilizerseurope.com

Italy national phosphorus platform launch meeting



The Italy Government has entrusted to ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development) the objective of establishing an Italy Phosphorus Platform. A launch meeting at the Italy Environment Ministry, Rome, on 26th March, brought together around fifty participants. The platform objectives cover all aspects of phosphorus sustainability: P in the food chain, optimising P use, recycling in organic materials and in mineral fertilisers, high tech uses of P such as batteries and fire safety. Four work-packages are engaged, each with an ENEA coordinator: WG1 = Market and

added value for recycled phosphorus (francesca.ceruti@enea.it), WG2 = Technologies and Best Practices (alessandro.spagni@enea.it), WG3 = Legislation – regulatory obstacles (sergio.cappucci@enea.it), WG4 = Promotion and long-term sustainability (roberta.decarolis@enea.it). An objective of the platform is to propose an R&D / innovation agenda, proposing innovation funding and support. Project deliverables for 2019 include a summary of EU policies and initiatives on phosphorus, an analysis of phosphorus flows in Italy (markets, supply, demand), a catalogue of technologies for phosphorus recovery and of best management practices, reports on the legislative framework and regulatory and policy proposals. WGs 1-3 have as deliverables by end 2019 reports of conclusions, with proposed actions. Deliverables of WG4 include, by end 2019, to identify organisations willing to participant in the Italy Phosphorus Platform as founding members and to define an operating scenario and budget. To date, around fifty organisations have expressed interest to join the new platform.

EU Green Week, 16th May 2019: innovation in fertilising products



A session at the EU Green Week, Brussels, 6th May, addressed “**Sustainable fertilisers**: greener practices to be promoted by the upcoming Fertilising Products Regulation”, with presence of DG GROW, DG ENVI, DG SANTE, DG AGRI and DG RTD.

Tiffanie Stephani, Fertilizers Europe presented progress made by European industry: greenhouse emissions from nitrogen fertiliser production and use have been reduced by 40% since 1990, and the EU fertiliser industry’s carbon footprint is now around half that of US industry. Regulation has been a key driver for this progress. The European industry is also actively supporting better fertiliser use, including with digital tools to support farmer decision making and in-field testing. In particular the [Cool Farm Alliance](#) has developed metrics for farm sustainability, for greenhouse emissions and nitrogen, but not yet for phosphorus.

Catarina Henke, EuroChem, explained the need of high nitrogen use efficiency (NUE) in fertilising practice and presented inhibitors and biostimulants as tools for sustainable intensification. With urease and nitrification inhibitors, NUE can be increased up to 13 % (recent meta-study results) leading to both, relevant yield increase (7.5 % in average of meta-studies) and substantially reduced nitrogen losses (N₂O and ammonia emissions, nitrate leaching). Inhibitors can improve NUE of both, mineral and organic fertilisers. A market survey by EuroChem shows that the main claims for biostimulants are to improve plant growth, root growth, crop yield, crop quality, resistance to abiotic stress and nutrient uptake. Strong research activities are presented as an essential path of the new products into markets.

Leon Terlingen, ICL, presented some approaches to improve fertiliser efficiency: foliar application of fertilisers, progressive application with drip-irrigation, controlled release fertilisers (CRF). CRFs use specific, very thin coatings (c. 50 µm) of fertiliser pellets to allow progressive release of the nutrients, over several months or longer according to plant needs. Because the fertiliser compounds are enclosed, they do not ‘burn’ and can be placed directly in plant root zones. Tests show that CRFs can reduce nitrogen leaching by over 50% and potassium leaching by 70%. The challenge now facing industry is to develop coating materials which continue to offer the water resistance over time required to ensure slow release, but are biodegradable to the new Fertilising Products Regulation requirements.

Chris Thornton, ESPP, [underlined](#) the **importance of the new EU Fertilising Products Regulation (FPR)**, not only for recycled fertiliser products, but also for nutrient recycling technologies: it is difficult to sell a technology across Europe if the resulting product is only authorised as a fertiliser in some countries. The new EU regulation, with CE Mark recycled fertilisers, will resolve this, whilst at the same time ‘national’ fertilisers can continue to be sold under national legislation corresponding to local markets and farmer requirements. He presented a number of ESPP member companies developing nutrient recycling, already in operation today or under construction full-scale: Veolia, Suez, Ecophos, EasyMining, Ostara, Roullier, Yara and ICL.

Frans Pauwels, fertilisers consultant, presented **organic fertilisers, noting their increasing agronomic recognition**, with the increasing use of soil structure and root-zone analyses. He summarised key developments in organic fertiliser products, including no-dust pellets, micro-granulation and wetting agents (for better plant availability), high-density granules (for better handling) and non-feedable forms (avoid risk of return to animal food chain for ABP-based products), foliar application organic fertilisers, products combining fertiliser and soil improving functions.

Matjaz Klemencic, DG SANTE, explained the **mechanism for authorisation of animal by-product (ABP) derived products in CE Mark fertilisers, which will be engaged after the EU Fertilising Products Regulation is published**. The primary aim is to guarantee safety of the food chain.

Isidro Campos-Rodriguez, DG AGRI, presented the **FaST (Farm Sustainability Tool for Nutrients)** which is included in the proposals for the new EU CAP (Common Agricultural Policy), see ESPP eNews [n°25](#) and [n°31](#), currently in discussion in Parliament and Council. The Commission is proposing the use of the FaST as part of the conditionality obligatory for all farmers receiving EU subsidies. The expected benefits are economic, optimizing the use of fertilizers, environmental, reducing the risk of pollution, and FaST will increase the digitalisation of the farming sector. Farmers can use either the new EU tool or any private or public tool (many exist) which is compliant with requirements. The authorities will verify (electronically) that the tool is being used, but not the data entered and not the implementation of the recommendations received from the tool by the farmer.

Industry speakers underlined the **importance of the new EU Fertilising Products Regulation** in providing a European regulatory framework for innovative fertiliser approaches and for products with today no European regulation (biostimulants, organic fertilisers). The new regulation will also widen the range of possible secondary input materials.

Johanna Bernsel, DG GROW, concluded the meeting. She explained that **the new EU Fertilising Products Regulation is designed to be “open”, enabling innovation and new recycling routes**. Whereas the current Regulation 2003/2003 covers only mineral fertilisers, the new FPR will cover organic and organo-mineral fertilisers, as well as soil improvers, biostimulants, etc., whilst also opening the market for recycled nutrient products. The new Regulation will thus open market opportunities for front runners in nutrient recycling, and in these different sectors now addressed.

EU Green Week website www.eugreenweek.eu

ESPP slides presented www.slideshare.net/NutrientPlatform/sustainable-phosphorus-sources-ready-for-the-european-market-eu-greenweek-2019-sustainable-fertilisers-greener-practices-to-be-promoted-by-the-upcoming-fertilising-products-regulation-16-may-2019

Regulation

EU Fertilisers Regulation published

REGULATIONS

REGULATION (EU) 2019/1009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 5 June 2019

laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003

(Text with EEA relevance)

The EU Fertilising Products Regulation (FPR) is now finally [published](#) in the EU Official Journal of 25th June (in all EU official languages). This new regulation opens the European market for recycled fertilisers; and also for organic fertilisers, biostimulants, composts and digestate, which to date could only be sold under different national legislations. It thus also opens the European market for nutrient recycling technologies. Products which respect the new FRP criteria (CE-Mark) will benefit from the “single market”

(can be sold anywhere in Europe) and further will automatically have End-of-Waste status. There is now a three year delay period before FRP implementation, that is before companies can place on the market CE-Mark fertilisers – but companies wishing to be ready in three years should start preparations now. The new FRP is flexible, in that the European Commission can add further products and materials by a comitology process. The JRC “STRUBIAS” report (struvite and recovered phosphate salts, biochars and pyrolysis materials, ash-based materials) is expected to be published soon, and these materials are expected to be added to the FRP annexes by end 2019 – early 2020. Work will now also start to define a list of animal by-products (and ABP end-points) to be integrated into the FPR, for which CMC10 “Animal By-Products” is currently an empty box. The European Commission is also working on testing methods and standards to accompany the new FRP, a ‘Questions and Answers’ document to explain how the regulation works, guidance on FRP product labelling, and definition of criteria for “By-Products” for CMC11 (industrial by-products, organic or food by-products ... other than animal by-products). To input to these activities, please contact ESPP.

EU Fertilising Products Regulation (FPR) publication text <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2019:170:TOC>

EFSA publishes Acceptable Daily Intake for phosphorus in food



European Food Safety Authority

The European Food Safety Agency (EFSA) has [derived](#), for the first time, a maximum safe dietary level of phosphorus in food (an “ADI” Acceptable Daily Intake for phosphates), at 40 mgP/kg body weight “protective for the human population”. This corresponds to a daily intake of 2.8 gP/day for an average adult (70 kg). It is stated that children and adolescents with average levels of phosphorus in their diet may currently exceed this ADI, and that this may be 10% of the population. EFSA note that this ADI is not applicable to persons with reduced kidney function, for whom lower levels are necessary. This ADI is in fact derived from the NOAEL of 167 mgP/kg body weight calculated by Hodge in

1960 (chronic toxicity study with rats, showing kidney impacts), multiplied by an uncertainty factor of x4 to extrapolate to humans (this is arguable, because some strains of rat are known to be, on the contrary, more sensitive to kidney problems). EFSA also conclude that phosphates have low acute toxicity and no concern for genotoxicity, developmental toxicity or carcinogenicity. The EFSA experts estimate the population average dietary phosphorus intake at 1.63 gP/day for adults, and the upper 95th percentile intake at 2.7 gP/day. Food additive phosphates contribute 6 - 30% to total dietary intake and it is recommended that the EU introduces maximum limits for levels of phosphates in “food supplements”, that is for tablets or liquids marketed as nutrient concentrates in a “dose” form, i.e. not for food additives included in foodstuffs or used in food processing. EFSA also recommends to consider revision of the current limits for toxic metals in food phosphates (arsenic, cadmium, lead, mercury), to revise limits for aluminium in calcium phosphate (E341), to include specification of possible nano-particle levels in food phosphates and to develop analytical methods to determine phosphate additives in foods and beverages.

“EFSA issues new advice on phosphates”, 12th June 2019 www.efsa.europa.eu/en/press/news/190612

“Outcome of the questions for health professionals in the fields of nephrology, mineral metabolism, cardiovascular and nutrition medicine on phosphates food additives re-evaluation”, EFSA 2019, Question number: EFSA-Q-2018-00312, EFSA Supporting publication 2019:EN-1624 www.efsa.europa.eu/en/supporting/pub/en-1624

“Re-evaluation of phosphoric acid-phosphates – di-, tri- and polyphosphates (E 338–341, E 343, E 450–452) as food additives and the safety of proposed extension of use”, EFSA Panel on Food Additives and Flavourings (FAF), adopted 4th June 2019, EFSA Journal 2019;17(6):5674 www.efsa.europa.eu/en/efsajournal/pub/5674

Detailed input received from five organisations during the consultation on this EFSA investigation is published, in particular input from ERA-EDTA (European association of kidney specialists) and from Friedrich-Schiller-Universität Jena, Germany.

EFSA definition of “food supplements” www.efsa.europa.eu/en/topics/topic/food-supplements

EBIC paper on justifying biostimulants product claims

Four authors from members or service providers of EBIC (European Biostimulant Industry Council) have published a [paper](#) outlining how they consider that products should justify the agronomic claim to provide biostimulant functions as defined in the new EU Fertilising Products Regulation (art. 47) “a product stimulating plant nutrition processes independently of the product’s nutrient content with the sole aim of improving one or more of the following characteristics of the plant or the plant rhizosphere: (a) nutrient use efficiency; (b) tolerance to abiotic stress; (c) quality traits; (d) availability of confined nutrients in soil or rhizosphere”. The paper summarises what experimental data should be provided to support claims, noting that claims can range

from addressing only one specific crop/soil situation to wider general claims, that test requirements should be proportional to the claims made (not excessively burdensome) and that harmonised European standards for test methods should be developed by CEN. It is underlined that industry trends are towards complex, multi-component biostimulant products and that the effects of biostimulants depend strongly on soil type and conditions. A justified biostimulant claim does not guarantee effectiveness under all conditions in the field.

“General Principles to Justify Plant Biostimulant Claims”, M. Ricci, L. Tilbury, B. Daridon, K. Sukalac, Front. Plant Sci. 10:494 Open Access <http://dx.doi.org/10.3389/fpls.2019.00494>

Exemption of digestate from REACH registration



It is our understanding that the addition of “digestate” to the list of materials exempted from the obligation of REACH Registration (Annex V) has finally been approved (Member States CARACAL Committee 17th May 2019), and the Regulation formalising this is expected to be published in July 2019. The modification of REACH (the European Chemicals Regulation) adds simply the word “digestate” to the list of materials exempted from registration (after compost and biogas, which were already specified). However, the Regulation making this modification gives more details, defining digestate as “a residual semisolid or liquid material that has been sanitised and stabilised by a biological treatment process, of which the last step is an anaerobic digestion step, and where the inputs used in that process are biodegradable materials originating only from non-hazardous source segregated materials, such as food waste, manure and energy crops”. The Regulation indicates that no REACH registrations for digestate have been submitted, but that this modification will remove uncertainties for producers and users of digestate and for enforcement authorities. This exemption of digestate in REACH Annex V was requested from the European Commission by the European Biogas Association and the European Sustainable Phosphorus Platform (ESPP) in 2014.

Draft Regulation adding ‘digestate’ to the REACH Annex V exemptions from registration: http://ec.europa.eu/growth/tools-databases/tbt/en/search/?tbtaction=search.detail&Country_ID=EU&num=630

Wisconsin Senate votes water quality trading legislation

The Wisconsin State Senate has unanimously voted a [bill](#) to enable a third-party clearing house to facilitate water quality trading. The bill would enable permitting of somewhat increased pollutant discharges if compensated by purchase of credits from brokers certified by the State regulator. An official state-wide clearing house would act as a credit bank and maintain a registry of all broker credits. This would enable, for example, a dairy farm to reduce nutrient emissions beyond their regulatory obligation and sell the “credit” to other nutrient emitters, such as industry or municipal sewage works. Such emissions trading systems enable pollution reductions to be made where they are most cost effective. Wisconsin legislation already allows emissions trading, but only directly (between the party reducing its emissions and the party purchasing credits). By introducing third-party brokerage, the new bill aims to make this system more operational. The bill specifies that trading must aim to reduce transaction costs, maximise pollution prevention and reduce the total pollutants emitted into the “hydrological area” (that is, emissions into one area cannot be credited in another). The bill is currently under discussion in the Wisconsin House of Representatives.

*Clean Wisconsin, 15 May 2019 www.cleanwisconsin.org/clean-wisconsin-applauds-unanimous-passage-of-sb-91
Wisconsin Assembly Bill AB113 <https://docs.legis.wisconsin.gov/2019/proposals/AB113>
Senate Bill SB91 <http://docs.legis.wisconsin.gov/2019/proposals/reg/sen/bill/sb91>*

Implementation and research

Kanton Zurich progresses with phosphorus recovery

Kanton Zurich, Switzerland, has [announced](#) a preliminary design study for a regional phosphorus recycling installation at Emmenspitz, Zuchwil, Switzerland, at the future regional waste resources recovery centre, to recover phosphorus as high-quality phosphoric acid from sewage sludge incineration ash. If the technical feasibility can be demonstrated within the framework of this study, then a full scale installation will be installed by 2026 (approx. 30 000 t/y, that is the ash from municipal sewage from a total of around 3.5 million population equivalent). The installation will use the process jointly developed by ZAR and Técnicas Reunidas in Madrid commissioned by the Canton of Zurich (see ESPP eNews [n°12](#) and project report below). This uses sulphuric acid to solubilise phosphorus and other elements in the ash, then hydrochloric acid and solvent extraction to separate phosphorus acid from iron and heavy metals. Phosphorus is recovered as 74% phosphoric acid, which can be sold to fertiliser, technical or animal feed industries. Iron chloride solution is recovered for recycling as a phosphorus-removal / coagulant agent in waste water treatment plants and the process residue can be used in the cement industry.

*“Klärschlamm in Rohstoff verwandeln: Neues Verfahren für industrielle Produktion geeignet”, 3rd June 2019, Kanton Zurich www.zh.ch/internet/de/aktuell/news/medienmitteilungen/2019/klaerschlamm-in-rohstoff-verwandeln-neues-verfahren-fuer-industrielle-produktion-geeignet.html
Phos4Life project final report, 4th June 2019, in German www.klaerschlamm.zh.ch*

Bio-economy partnership strategy, new projects

The Bio-Based Industries Consortium, a 3.7 billion € EU – industry partnership, has published a 2050 “bio-society” vision [document](#), and [launched](#) 18 further funded R&D projects. The vision paper emphasises food security, sustainability job creation and circular economy, underlining the need for circularity in agriculture “returning the necessary ingredients to the soil to increase soil carbon ... while furthering the use of compost as a fertiliser”. The newly funded projects include several which concern nutrient valorisation:

- [B-FERST](#) “Bio-based FERtilising products as the best practice for agricultural management”, coordinated by Fertiberia with FCC Aqualia
- [DEEP-PURPLE](#) “Conversion of diluted mixed urban bio-wastes into sustainable materials and products in flexible purple biorefineries”, coordinated by Aqualia
- [FARMYING](#) “Flagship demonstration of industrial scale production of nutrient Resources from Mealworms to develop a bioeconomy New Generation” (*Tenebrio molitor*)
- [WASEABI](#) “Optimal utilization of seafood side-streams through the design of new holistic process lines”, coordinated by the Danish National Food Institute

“BBI JU launches 18 new projects, celebrates its 100th project”, 10 May 2019 www.bbi-europe.eu/news/bbi-ju-launches-18-new-projects-celebrates-its-100th-project

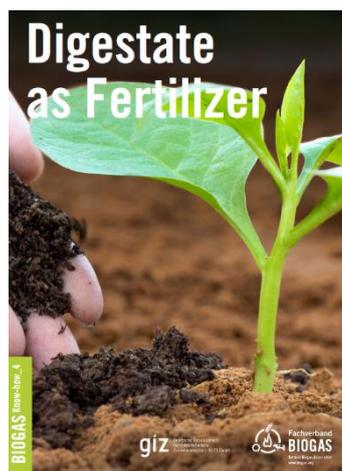
“The circular bio-society in 2050”, BIC (Bio-based Industries Consortium) vision paper, June 2019
www.biconsortium.eu/sites/biconsortium.eu/files/documents/Vision%20for%20a%20circular%20bio-society%202050.pdf

Scientists push for enhanced efficiency fertilisers

A [paper](#) in Nature Sustainability suggests that the fertiliser industry should be required to sell a quota of “enhanced efficiency fertilisers” (EEFs). These are considered here as (1) slow and controlled release fertilisers, often achieved by enclosing the fertiliser granule in a polymer coating and (2) nitrogen inhibitors. Cited meta-analysis studies suggest that EEFs can increase nitrogen use efficiency (NUE) by an average 13%, can increase yield by 5-15%, can reduce nitrogen leaching losses to groundwater as well as reducing farm labour costs (fewer fertiliser applications). The US has seen an increase of 10% in NUE over the past two decades, related to farming practices, but EEFs represent today only around 13% of fertiliser sales. The authors suggest that policy could require the fertilisers industry to either sell a minimum percentage of EEFs, or to deliver a specified NUE (calculated on the basis of EEF efficiencies demonstrated in trials). They conclude that a 50% EEF sales obligation (by 2030), for US maize production only, would lead to US\$ 300 million economic benefits for farmers, increased profits of US\$ 160 million for the fertilisers industry and environmental benefits of US\$ 8 billion (related to nitrogen losses). They note that questions must be addressed concerning the biodegradability of the polymer coatings used in controlled release fertilisers, and possible health and environmental effects of compounds used in EEFs.

“A technology-forcing approach to reduce nitrogen pollution”, D. Kanter & T. Searchinger, *Nature Sustainability*, vol. 1, Oct. 2018, 544-552, <https://doi.org/10.1038/s41893-018-0143-8>

State of the art: digestate as fertiliser



A 60-page [document](#) by the German biogas association summarises information about use of digestate as fertiliser, with examples of operation of digestate processing. Nearly 130 million tonnes/year of digestate are produced by Europe’s biogas plants. Data on typical nutrient content of digestates is provided (phosphorus content 1 kgP / m³ for liquid digestate to 2.2 kgP/m³ for solid separated fraction 24% dry matter). Technologies for application of digestate to land are outlined, noting the need to minimize ammonia emissions, e.g. by injection into the soil (using slitters or digestate cultivators) or by acidification of the digestate. Digestate treatment processes are summarised: separation, drying, pelletising, biological treatment, evaporation, membrane filtration, phosphate salt precipitation, and ammonia stripping/recovery. Digestate marketing is discussed: nearly all liquid digestate in Germany is used in conventional agriculture, whereas over a quarter of processed digestate goes to specialist markets such as organic farming, landscaping and gardening, where a higher price can be obtained. Eight examples of biogas plants operating digestate processing worldwide are presented (phosphate salt recovery, digestate evaporation, dribble bar application (onto soil surface underneath crop), composting, membrane filtration, separation, nitrogen stripping) and a catalogue of processing technology suppliers.

“Digestate as fertilizer”, GIZ and Fachverband Biogas, ISSN 2626-3475, November 2018 www.digestate-as-fertilizer.com/Download/Digestate_as_Fertilizer.pdf

Science

Optimizing bio-based fertilisers in agriculture



New ESPP member, [LEX4BIO](#) is a Horizon 2020 R&D project, started 1st June 2019. The main goal of the project is to provide a knowledge-based on bio-based fertilisers, in order to secure safe and efficient use of nutrient rich-side streams in European agriculture, reducing the dependency on imported phosphorus fertilisers and energy intensive nitrogen fertilisers. The objectives are to optimise the usage of bio-based fertilisers from side-streams, ensure their safety, build evidence-based trust in their usage and develop legislative framework. LEX4BIO will collect and process regional nutrient stock, flow, surplus and deficiency data, and review and assess the required technological solutions. Furthermore, socioeconomic benefits and limitations to bio-based fertiliser use will be analysed. A deliverable of LEX4BIO will be a toolkit to optimise the use of bio-based fertilisers and to assess their environmental impact in terms of non-renewable energy use, greenhouse gas emissions and other LCA impact categories, In order to facilitate the connection between bio-based fertiliser production technologies and regional requirements.

LEX4BIO information https://forschung.boku.ac.at/fis/suchen.projekt_uebersicht?sprache_in=en&menue_id_in=300&id_in=12743

LCA shows how system boundaries change the answer

An [life cycle analysis](#) (LCA) from IRSTEA, Brittany, France, illustrates how the choice of 'system boundaries' can completely change the conclusions of such studies. This study compares the LCA of production of mineral fertiliser to four different processes for phosphate recovery from sewage (BioAcid, struvite precipitation, AshDec and Gifhorn). The study allocates (choice of LCA system boundaries) all environmental impacts related to wastewater collection, sewage treatment, sludge drying and disposal to the recovered phosphate production (per kg P), resulting in impacts up to 14 000 higher than mineral fertiliser production from mined phosphate rock. Other LCA studies published to date do not make this allocation, because they consider that the collection and treatment of municipal wastewater are in any case necessary (to protect water quality and to respect regulatory requirements) and are not driven by the objective of phosphate fertiliser production, and so they allocate only impacts of the phosphorus recovery process itself. The authors here discuss these different possible allocation (boundary setting) approaches. They conclude that even if only the phosphorus recovery process itself is considered, electricity, chemical reagent and infrastructure needs are still higher for P recovery from sewage/sludge, and that further work is needed to improve the efficiency of phosphorus recovery processes.

"Environmental impacts of phosphorus recovery from a "product" Life Cycle Assessment perspective: Allocating burdens of wastewater treatment in the production of sludge-based phosphate fertilizers", M. Pradel, L. Aissani, *Science of the Total Environment* 656 (2019) 55–69
<https://doi.org/10.1016/j.scitotenv.2018.11.356>

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