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Manure nutrient recycling

ManuREsource 2017 conference

The 3rd ManuREsource manure recycling conference brought together 230 participants in Eindhoven, The Netherlands, 27-28 November. This third conference, four years after the first ManuREsource in 2013, confirmed that a range of technologies are today available and proven for manure processing to enable energy recovery and nutrient recycling (see Newtrient catalogue and company success stories below), that the EU regulatory context is evolving considerably, and that the main obstacle to implementation continues to be economic. Johanna Bernsel, European Commission DG GROW, presented the proposed new EU Fertilisers Regulation, currently in the decision process, which will create a single market for both recovered nutrient products and for processing technologies. Discussions showed that regulation effectively obliges farmers to implement manure processing where constraints on manure spreading (regional manure excesses resulting from livestock concentration) meet water protection obligations. Cees Jan Hollander presented Danone, a global leader in fresh dairy products, bottled water, nutrition products for young children and medical nutrition. Danone has a direct relationship with around 140 000 dairy farmer suppliers worldwide with 2.5 million cows. Hollander explained why manure management is essential to the company’s sustainability and social commitments: balancing greenhouse emissions (company and supply chain zero net carbon objective for 2050) and local supplier farmer resilience: without farmers no food. Emile Snauwaert, VCM, summarising the conference, concluded that the overall objective of sustainability will continue to push towards manure processing. She noted that a key objective should be recovered product marketability, and that challenges are how farmers can pass on costs and consumer acceptance of use of recycled nutrients in food production.

ManuREsource 2017 (International Manure Management and Valorization Conference), organised by VCM (the Flemish centre for coordination of manure processing), INAGRO, Ghent University, POM West-Flanders and the Netherlands Nutrient Platform www.manuresource2017.org
Press release with ManuResource 2017 conference outcomes
Processed manure in the Nitrates Directive

Previous ManureResource conferences have raised the question of the obstacle to manure nutrient recycling posed by the 170 kgN/ha application limit for “processed manure” in Nitrate Vulnerable Zones (NVZs = 40% of EU territory) fixed by the Nitrates Directive (see SCOPE Newsletter n°100). ESPP has developed, with stakeholders, proposals on this question, transmitted to policy makers. A discussion meeting took place on this question at ManureResource 2017, led by ESPP and VCM, with participation of the European Commission DG Environment and several government representatives. ESPP presented introductory slides outlining the context, underlining that this limit and varying interpretations between Member States and NVZ Action Plans obstructs manure nutrient recycling and the market for recycling technologies. In some regions but not others, products such as digestate containing traces of input manure but based mainly on non-manure inputs are classified as “processed manure”. The meeting heard that the EU Nitrates Committee (Member States) and DG Environment intend to mandate the European Commission Joint Research Centre (JRC) to propose specifications under which certain nutrient products recovered from manure might not be considered subject to this 170 kgN/ha “processed manure” limit. The objective proposed by DG ENVI is a JRC mandate in early 2019, completion the JRC study before end 2020, and then agreement of guidelines specifying implementation conditions for this point of the Nitrates Directive. The meeting discussed the scope of this study, noting that the Nitrates Directive addresses only nutrient pollution prevention (eutrophication, groundwater nitrates) but that some participants consider that other aspects should also be considered in order to avoid possible negative side-effects. However, too wide a study scope would make it unrealistic within reasonable delays and resources. Possible study questions proposed were:

- Agronomy: nutrient efficiency, nutrient losses to eutrophication/groundwater, compared to virgin mineral fertilisers
- Possible product organic carbon (C_{org}) cut-off limits as simple indicators of agronomy
- Other environmental impacts: energy/carbon/greenhouse emission balance, ammonia emissions, contaminants, soil carbon, impacts, overall nitrogen cycle \rightarrow Life Cycle Analysis (question of boundaries)
- How to specify or limit use conditions of recycled nutrient product
- Indirect consequences: resulting increase of nitrogen or phosphorus application (respectively) resulting from “relaxing” P or N application limits
- Impacts on livestock production concentration and intensification
- Generation of sidestreams from manure processing (other than the recycled nutrient product): fate, impacts of these streams
- Does the manure processing aim to produce a product or just “remove” the waste?
- Interactions with future EU Fertilisers Regulation, End-of-Waste status, Animal By Products End Points

Further information see www.phosphorusplatform.eu/regulatory

Call for experts Nitrates Directive manure processing

In the context of the proposed EU Commission JRC study to propose modalities for exempting certain manure recycling nutrient products from Nitrates Directive “processed manure” application limits, the Netherlands Government is calling for experts for an informal group to provide evidence and input data to JRC. All experts in manure processing, in agronomy of recycled nutrient products, digestates or composts, or in environmental impacts and life cycle analysis of nutrient recycling and recycled nutrients, are invited to contact, or to send relevant data and publications to, Harm Smit, Ministry of Agriculture, Nature and Food Quality h.j.smit@minez.nl

Send expert names, organisation and email or data and publications to h.j.smit@minez.nl

Manure processing technology supplier assessment

Steve Rowe, CEO of Newtrient, the company representing United States dairy producers, presented at ManureResource 2017 and met the European nutrient platforms to discuss extending to Europe the Newtrient assessment and catalogue of manure processing technology suppliers. The Newtrient online suppliers catalogue provides independent expert evaluations of technologies and suppliers, covering technical and economic aspects, after-sales service and farmers’ operating experience (see SCOPE Newsletter n°125). Over 220 technologies/suppliers have been evaluated, and 180 are online. To date, the catalogue covers only technologies for dairy manure, as supplied in the US. It is now proposed to extend the Newtrient technology catalogue to European suppliers, including after-sales in Europe, and to widen to pig and poultry manure treatment. Companies interested in being assessed in Europe should contact info@phosphorusplatform.eu and if an initial number of companies engage then conditions for this assessment can be defined and moved forward.

Newtrient online catalogue of manure processing technology suppliers www.newtrient.com/Catalog/Technology-Catalog If your company (technology supplier) is interested to be evaluated in Europe for inclusion contact info@phosphorusplatform.eu

Round table session public awareness and the role of agro-food concerns

At the 3rd ManureResource manure recycling conference ESPP has led a round table session on public awareness and the role of agro-food concerns. The central question “What do agro-food concerns think which is necessary for nutrient recovery in practice?” was discussed among the table with special invited guests from the dairy food industry with Cees Jan Hollander from

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Danone and Jan Willem Straatsma from Friesland Campina. The major challenge discussed was “Who needs to pay for the possible extra cost for nutrient recovery from manure processing, as contribution to environmental sustainability? The consumer agro-food sector, manure processor and/or farmer? The table identified three most important constraints for the transition towards a circular economy regarding manure processing (1) subsidies can disrupt the market, but at the same time they can be stimulating to persuade the farmers, (2) the consumer does not know where his/her food comes from, and (3) knowledge about manure processing among policy makers, farmers and consumers is limited. The most interesting solutions and conclusions were (1) farmer must be facilitated in searching the best solution, they should not bear the risks alone, but together with companies, (2) the polluter pays principle should be applied, all players in the value chain are responsible including farmers, food companies and consumers, (3) (eco)-labelling can play a major role in marketing products that stimulate sustainable use of nutrients, and (4) there is a need for an ongoing campaign to link consumers to farmers, by transparency and education. In the end, farmers, food companies and consumers together within the market have to find and implement the solution, starting with piloting of manure processing, followed by full scale roll-out and then making it mainstream, but society needs to want it.

For any further follow up contact ESPP via info@phosphorusplatform.eu

Success stories presented at ManuREsource 2017

Terramass manure digestion

Maurice Ortmans indicated that Terramass intends to produce organic fertilisers from pig manure at its plant in Odiliapeel, The Netherlands (ManuREsource 2017 site visit). Around 200 000 tonnes/year (wet mass) of pig manure from 120 pig farmers is first anaerobically digested, producing methane energy with the aim of producing own heat and electricity to run the post-treatment plant. Since September 2017, the digestate is treated by solid-liquid separation, followed by treatment of the liquid fraction by evaporating and ammonia stripping to recover a liquid nitrogen fertiliser (ammonia). Clean water is produced (80% of incoming manure) and returned to surface water. The company is building a drying and conditioning installation to convert the digestate into pelletised organic fertiliser, which it is intended to market to agriculture with the aim of producing own heat and electricity to run the post-treatment plant. Since September 2017, the digestate is treated by solid-liquid separation, followed by treatment of the liquid fraction by evaporating and ammonia stripping to recover a liquid nitrogen fertiliser (ammonia). Clean water is produced (80% of incoming manure) and returned to surface water. The company is building a drying and conditioning installation to convert the digestate into pelletised organic fertiliser, which it is intended to market to agriculture, in export and to the retail market. Long term contracts with the farmers enable investment in the treatment centre and product market development.

More information www.terramass.nl

VP-HoBe manure processing

Roel Keursten and Ruud Bellemakers presented VP-HoBe manure processing technology. The technology supplier has already today over 700 000 tonnes/year pig manure (wet weight) manure processing capacity installed in The Netherlands. The company is today developing new processes aiming to process manure completely to a liquid nitrogen concentrate fertiliser, a mineral phosphorus and carbon fertiliser, a mineral potassium salt, an organic fertiliser/growing media (biochar) and clean water (after reverse osmosis). A 250 000 tonnes/year capacity pig manure (wet weight) plant already in operation and implementing these new processes is at America (NL) and will be operational in 2018.


Dorset manure nutrient recycling

Henk Haaring explained that Dorset Green Machines supply a set of technologies to process liquid manure slurry to organic fertiliser pellets and clean water, without using reverse osmosis membranes or ultrafiltration. A simple filter system is used for initial solid-liquid separation, followed by drying and pelleting of the solid fraction, with addition of nutrients to produce bespoke organic fertiliser pellets. The liquid fraction is vacuum evaporated, enabling condensation of purified water (<5 mg ammonia per litre) and the residual is returned to the solid fraction. The company has to date installed capacity producing some 100 000 tonnes/year of horticulture and organic fertiliser products worldwide.

More information www.dorset.eu

Friesland Campina working with dairy farmers

Jan Willem Straatsma presented FrieslandCampina, the dairy cooperative covering around 90% of Netherlands milk production, with 22 000 staff, working with 13 500 farmers in 3 countries and via our Dairy Development Plan also with many dairy farmers in other countries. The cooperative recognises that manure processing is key to sustainability of dairy production, and essential to enable conformity to regulatory phosphorus and nitrogen spreading limitations. This corresponds to carbon accounting and sustainability objectives fixed by food industry customers, in particular Danone (see below). FrieslandCampina’s JUMPSTART project is working with farmers, technology-providers, dairy-companies

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and networking companies, with the objective to implement 1 000 manure digesters on dairy farms/groups of farms in The Netherlands, so saving 600 000 tonnes/year CO2. FrieslandCampina has evaluated technologies and chosen and contracted with three suppliers (Bioelectric, BiogasPlus, and Host) to ensure price value, maintenance service conditions and methanisation performance for farmers. To date, 10 digesters are in start-up phase, with a further 70 candidate sites. FrieslandCampina is currently testing a nutrient recovery process to add-on to treat digestate. This has solid-liquid separation, then nitrogen stripping (using air) and ammonium sulphate recovery and phosphate salt precipitation.


**BASF Vizura® – improving manure nitrogen efficiency**

At ManuRESOURCE, Dr. Jorge Sanz-Gomez and Manuel Knauer of BASF presented Vizura®, an ammonium nitrogen stabiliser for manure slurries and digestates. Vizura® is based on DMPP (3,4-dimethylpyrazole phosphate) and is dosed into the slurry or digestate either on the farm into the slurry lagoon or on the tractor during spreading, at rates of 2-3 litre/ha. Vizura® inhibits the action of Nitrosomasfor several weeks. These bacteria nitrify ammonium to nitrate. This ammonium stabilisation reduces the risk of nitrate leaching and reduces N₂O emissions. Nitrogen is conserved and remains crop-available as ammonium for longer periods. Advantages can include: application of slurry before sowing with ammonium continuing to be available when needed by the growing crop, reduced mineral fertiliser application, higher yields because of better manure nitrogen availability. Furthermore, an increased ammonium uptake leads to better availability of phosphorus and several micronutrients. Vizura can be used on all crops, and has been demonstrated on several crops e.g. maize, cereals, rapeseed, grassland, beets and potatoes. Today BASF supplies Vizura® in several European countries.


**Nutrient BASF Vizura recycling success stories**

Paques sulphur recovery from biogas

More than 25 000 tonnes/year of sulphur are recovered from biogas by Paques Thiopaq installations at around 200 biogas and natural gas sites in 30 countries. The Thiopaq system combines slightly alkaline gas-stripping (pH 8-9) to remove sulphur from biogas (present as hydrogen sulphide H₂S) then a specific biological reactor to convert this to elemental sulphur. In this process, the biological reactor restores alkalinity regenerating hydroxide which is (re)used for the gas-stripping. The recovered biosulphur is in the form of small crystals, which are hydrophilic, so offering agronomic properties preferable to Elemental Claus Sulphur as usually produced in the oil and gas industry. Sulphur is an important plant nutrient, essential for nitrogen uptake, and increasingly needed for many soils and crops as atmospheric sulphur deposition from acid rain has been largely reduced. Often the Thiopaq biosulphur production is used locally around the biogas sites, by including it into digestate used for soil conditioning in agriculture. Some 2 000 tonnes/year of biosulphur is separately handled by Fertipaq and processed into special fertilizer products which are applied in Europe and China for traditional and organic farming.


**Regulatory and policy**

**Policy recommendations ENRD group on Resource Efficient Rural Economy**

The final report, factsheet and additional outcomes of the European Network for Rural Development (ENRD) thematic group (TG) on Resource Efficient Rural Economy have been published. Throughout the year, ESPP and other stakeholders focussed on how to support the integration of resource efficient activities and thinking relating to soils, carbon, nutrients and water into the implementation of rural development programmes (RDPs). ESPP gave a presentation about the recycling of nutrients from bio-wastes as opportunity for rural economy. The TG concluded that motivation, knowledge and policy gaps associated with taking action to improve soil and water management via RDPs should be tackled. The recommendations for better advice and training for farmers and farm advisors, appropriate and accessible RDP financial support to (young) farmers and long-term agronomic demonstration. More specific recommendations are provided in the final report. Additional

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interesting outcomes are the collection of relevant good practice examples, synthesis report on resource efficiency in 6 RDPs (e.g. leaching of minerals and nutrient and soil erosion), EU level overview of RDP support to resource efficiency, and case studies on the implementation of resource efficiency of soils and water.

For follow up contact Kimo van Dijk (ESPP) kimovandijk@phosphorusplatform.eu

Greece condemned for failure to treat wastewater

The European Court of Justice (ECJ) has ruled that Greece has failed to ensure adequate treatment of sewage from five agglomerations of population 2 000 – 10 000 p.e. (Prostotsani, Doxato, Eleftheropolii, Vagia and Galatista). The Urban Waste Waster Treatment Directive (1991/271) requires “secondary or equivalent” treatment of sewage for agglomerations of this size by end 2005. The action brought by the European Commission against Greece also concerned the inadequacies of sampling data produced to demonstrate effective treatment. Sewage works investment projects are today underway in these five agglomerations to enable compliance. The European Commission also has proceedings underway against Spain for inadequate sewage collection and treatment in 17 agglomerations (17 outstanding from an initial procedure concerning 35 agglomerations concerned by an ECJ 2011 judgement), with a 46 million € fine plus daily additional fines requested.


Environmental taxation in the EU

The share of environmental taxes in EU national governments revenue fell from 6.6% in 2005 to 6.3% in 2015, according to Eurostat (% of total government revenue including taxes and social contributions). Most of the environmental tax revenue (77%) came from taxes on energy, with 20% from taxes on transport and only 3.5% from taxes on pollution and resources. The highest shares of revenue from environmental taxes are in Bulgaria, Croatia, Greece, Slovenia (all >10%) and the lowest in Belgium, France and Luxembourg (all <5%). The share of environmental taxes is one indicator of the EU resource efficiency scoreboard, and the EU’s Resource Efficient Roadmap recommends to increase this share to at least 10%. The European Commissioner for economic and financial affairs, Pierre Moscovici, again underlined the need for action at the European Clean Air Forum, Paris, November 2017. He noted that air pollution could cost nearly 5% of average income per capita by 2060 if action is not taken, that energy taxes are essential to address this, and that European Semester economic policy coordination exercise which aims to increase energy and environmental tax share has seen limited progress.

Greening the European Semester http://ec.europa.eu/environment/integration/green_semester/expert_group_en.htm

Pharmaceuticals in the environment

Twenty NGOs and medical organisations have signed a joint letter to the European Commission expressing concern about the threats posed by pharmaceuticals in the environment. The initiative is led by Health Care Without Harm in the context of “World Antibiotics Awareness Week” and also coincides with a European Commission public consultation on pharmaceuticals (see ESPP eNews n°17). The letter notes that 631 different pharmaceutical products have been detected in the environment in over 70 countries worldwide, and that over 4 000 active substances are used in pharmaceuticals today. The letter calls for a number of actions to be integrated into EU policy, including minimising pharmaceutical losses to the environment, application of “producer responsibility” to the pharmaceutical industry (for consequences of pharmaceuticals in the environment), extending risk assessments, promoting rational pharmaceutical use, pharmaceuticals with lower environmental impact, improving municipal sewage treatment to prevent environmental pollution by pharmaceuticals, threshold values for pharmaceuticals in waster bodies and reduced discharge of pharmaceuticals from livestock production. Elsewhere, a report published by Germany’s energy and waste industry federation BDEW estimates that 4th stage pharmaceuticals removal in large sewage works across Europe (by ozone or active carbon) would cost 110 billion € (EU, total for 30 years), much more expensive that reducing pharmaceutical inputs to wastewater. The letter does not refer to the question of pharmaceuticals in sewage biosolids or manure recycling. ESPP, the
water industry and environmental NGO European Environment Bureau have signed a joint position to the EU requesting increased research and risk assessment in these areas, which are key to sustainable and safe nutrient recycling.

"20 Organisations sign declaration expressing serious concern about pharmaceuticals in the environment in the EU", Health Care Without Harm (HCWH) 16 November 2017 www.notharm-europe.org/articles/press-release/europe/20-organisations-sign-declaration-expressing-serious-concern-about


ESPP – water industry – EEB (European Environment Bureau) joint position on pharmaceuticals and organic contaminants in sewage biosolids and manures and nutrient recycling www.phosphorusplatform.eu/organic-contaminants

England new farming rules to protect water

The United Kingdom will implement from 2nd April 2018 new rules for all farmers in England aimed at both protecting water and saving money for farmers. The eight new rules are based on recognised good practice and include matching nutrient supply to crop and soil needs and avoiding manure contamination of water (five rules) and actions to reduce soil loss (three rules). The fertiliser rules will require soil testing (phosphorus, potassium, magnesium, nitrogen and pH), planning use of manure and fertilisers (taking into account factors such as crop needs, ground cover, weather forecasts, drainage and water), specifications on manure storage and application and no application of fertilisers within two meter of surface waters. Rules addressing soil erosion include use of organic manure and fertiliser, cultivation practices, protection of surface waters from soil erosion by livestock (including not positioning livestock feeders within 10 meter of surface waters). The UK Government notes that “most farmers are already likely to comply with the rules”. The rules will be reviewed in three years time.


Research

Microplastics in soil and in wastewaters

The Denmark Ministry of Environment and Food has published a report on microplastics. Microplastics (20-500 μm) were analysed in inlet and outlet of ten sewage treatment plants (representing in total nearly 30% of Denmark’s sewage), in sewage sludge from five of these plants, and in ten farm soils (five which had received sewage sludge in recent years, and five which had never received sludge). 0 – 0.7% of inflow microplastics in sewage works were emitted to the aquatic environment, suggesting that nearly all were being retained to sewage sludges. This means that 3 – 4 000 tonnes/year of microplastics go to farmland in sewage biosolids in Denmark. However, the levels of microplastics in agricultural soils was low (0.0001 - 0.001 % w/w of soil) and was considerably higher (average 9x higher, median 2x higher) in the farmland soils which had never received sewage sludge (with polyethylene being the most detected polymer in these soils). These results suggest that the principal source of microplastics in agricultural soils is not sewage sludge, but possibly agri-food packaging materials. The report does not provide any information on whether microplastics in soil pose any environmental risk, nor on their long term fate.


EU ROUTES conclusions on organic contaminants in biosolids

The EU FP7-funded ROUTES project (see SCOPE Newsletter n°100) studied the fate and impact of organic contaminants in sewage biosolids when used on agricultural soils, after several different anaerobic digestion and other treatment processes. The project looked at polycyclic aromatic hydrocarbons, PCBs, organic halogens, phthalates, LAS, NPEOs and quaternary ammonia compounds (from cleaning products), pharmaceuticals and biocides. Toxicity of treated sewage sludges was laboratory tested on plants/seeds, earthworms, daphnia, soil bacteria, algae. Also, soil organisms in fields which had received sewage biosolids for several years were studied, in particular earthworms. Conclusions were that sludge application to land is not phytotoxic, with small changes to some plant root development disappearing within a few months of application. There were some toxicity impacts on some bacteria. Overall, the report concludes that application of sewage biosolids at agriculturally relevant levels has margin of at least 1 000 for toxicological safety to soil organisms.

Final report EIP-AGRI Focus Group on Nutrient Recycling

The European Commission EIP-AGRI “Focus Group” on Nutrient Recycling has published in November its final report and eight of mini-papers. The conclusions were summarised in detail in SCOPE Newsletter n°124, February 2017. The Focus Group was established following a proposal submitted by ESPP and 60 other organisations in 2015. The final report makes recommendations to EU research and rural development policies (Operational Groups). Seven research needs identified are: LCA, Nutrient Use Efficiency assessment methods, organic contaminants (impacts, mitigation), perception and acceptance of recycled nutrients, remote sensing to support precision fertilisation using bio-based fertilisers, on-farm techniques for nutrient recovery and for measuring nutrient content in manures, production of recycled nutrient products adapted to specific crops and with reliably consistent composition. Recommendations for Operational Groups are: demonstration of nutrient recycling and of use of recycled nutrient products, integration of recycled nutrients into food-industry quality and certification schemes, cooperative business models for nutrient recycling and exchange of experience between farmers of bio-based fertilisers.


Agenda

- **Sustainable Development in the Food & Beverage Industry Summit**
  16 - 17 January 2018, Berlin, Germany - [Website]
  ESPP will present and chair a special session on nutrients circular economy within the food & beverage industry

- **SPA Phosphorus Forum 2018**
  27 February 2018, Tempe, Arizona, USA - [Website]
  Annual forum of the North America Sustainable Phosphorus Alliance

- **Conference Symbiosis and Circular Economy in fertilizers Are by-products a thing of the past? Unlocking the new fertilizer Regulation**
  7 March 2018, Brussels, Belgium - [Flyer] - [Email] - [Registration]
  Organized by Fertilizers Europe

- **Phosphates 2018 conference**
  12 - 14 March 2018, Marrakesh, Morocco - [Website]
  Gathering for decision-makers representing the fertilizer, feed and industrial phosphates industries.

- **IFAT trade fair for sewage - waste – resources**
  14 - 18 May 2018, Munchen, Germany - [Website]

- **3rd European Sustainable Phosphorus Conference (ESPC3)**
  11 - 12 June 2018, Helsinki, Finland - more details here soon

- **6th Sustainable Phosphorus Summit (SPS2018)**
  20 - 22 August 2018, Brasilia, Brazil - [Website]
  For the first time, the Summit will be held in Latin America, enabling a spotlight on the Tropics, where phosphorus sustainability is a big concern

- **6th Symposium of Phosphorus in Soils and Plants (PSP6)**
  10 - 13 September 2018, Leuven, Belgium - [Website]
  This symposium will address the challenges of phosphorus scarcity in many terrestrial and agroecosystems as well as the challenges of managing excess phosphorus where such has occurred

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