STØTTET AF
Promilleafgiftsfonden for landbrug

Notat

SEGES Innovation
Planter & Miljø

Artikel i European Sustainable Phosphorus Platform's nyhedsbrev for december 2023	Ansvarlig	MAMD
	Oprettet	20-12-2023
Projekt: 8643, Kompakte filtersystemer for fosfor i drænvand fra høj- og lavbundsjord – FosLav	Side	1 af 2

Afrapportering af kort artikel i European Sustainable Phosphorus Platfom's nyhedsbrev for december 2023

SEGES Innovation blev i efteråret/vinteren 2023 kontaktet af European Sustainable Phosphorus Platform (ESPP) for at høre, om de måtte udgive en artikel om FosLav projektet i deres nyhedsbrev for december 2023.
Det er muligt at tilgå ESPP's nyhedsbrev fra 2023 her: ESPP eNews (phosphorusplatform.eu)

Den korte artikel er udarbejdet af ESPP på baggrund af en poster, som SEGES Innovation præsenterede på RAMIRAN 2023 konferencen i september 2023. Denne præsentation fandt sted i regi af Promilleafgiftsfondsprojektet "Videreudvikling og optimering af målrettede dræn- og lavbundsvirkemidler", som var SEGES Innovations foregående projekt vedr. fosforfilter.

Soil phosphorus and eutrophication

Mario Álvarez Salas, ETH Zurich, showed data on P-fractions in secondary nutrient materials and in soil, with 20-year application of high loadings in the **CRUCIAL long term field experiment, Denmark** (250 - 500 kgP/ha/year). Materials applied were household waste compost, sewage sludge (sewage works using iron salts for P-removal), three manures/slurries, human urine and mineral fertiliser. With these high P loadings, results showed P accumulation in topsoil, but only for around one quarter to one half of applied P, with the remaining P being lost or moving to deeper soil. **P_{total} losses were lower with sewage sludge than with compost or cattle manure**. The ratio of soil P accumulation versus loss did not correspond to P-fractions in the applied materials.

Majken Meldorf Deichmann, SEGES Innovation, presented trials of phosphorus traps to treat drainage water from peatlands. In order to achieve greenhouse gas reduction objectives, Denmark aims to rewet over 50 000 ha of drained peatlands, because **CO_2 loss from drained – cultivated peatlands is estimated to contribute nearly one third of Danish agriculture climate emissions** (more than livestock = c. 22%). Risk of increased phosphorus losses is currently blocking a third of rewetting projects. At three study sites, different P-trap systems were tested, including electro-flocculation (iron, plus chitin coagulant), sedimentation, biochar and sorbent filters. These systems achieved up to around 2/3 removal of total P. Challenges are cost for small scale systems and impacts on effectiveness of dissolved organics in water, which can be important for peatlands.

Penny Johnes, University of Bristol, explained the importance of nutrients linked to dissolved organic matter (DOM) for eutrophication. In several studies, radiolabelling, laboratory bioassays and field mesocosms show that uptake of DOM phosphorus and nitrogen, chlorophyll response and protein synthesis vary between algae species, seasons, different sites/environments and different dissolved compounds (amino acids, glucose-phosphate, orthophosphate). Overall, both dissolved organic nitrogen and dissolved organic phosphorus are available to algae and other plants, with uptake rates equal or even higher than for inorganic nutrients. Uptake is fastest in low-nutrient waters, but the **dissolved organic nutrients also drive eutrophication in nutrient-enriched waters**.

Nutrient recycling processes

Oscar Schoumans, Wageningen University & Research, summarised pilot-scale testing of a range of manure processing technologies in EU Horizon funded research projects **SYSTEMIC** and **FERTIMANURE**. These trials show the importance of solid/liquid separation technologies, as this is key to partitioning nutrients and organics, reducing water content of solid products and particulates in liquid fractions intended for nutrient recovery (e.g. interference with membranes).Separation efficiency can vary by factors of 2-3 between centrifuge, screw press and filter press. Similarly, quality of "mineral concentrates" varies widely between membrane trials, with variability of factor 10+ in e.g. organic carbon content or nitrogen species. Recovered ammonia solution "concentrates" contain 7-8% recovered N / wet weight. These large research projects have shown that valorisation of manure is technically possible, that the recovered fertilisers can provide good agronomic properties, especially if adapted to crop needs by blending with other nutrients. However, careful attention to application conditions is essential and processing costs are high compared to bulk mineral fertilisers.

Matias Vanotti, US Department of Agriculture, presented tests of fermentation of pig manure solid fraction to solubilise phosphorus, enabling recovery by precipitation. See similar work by Daumer, INRAE, in ESPP SCOPE Newsletter n°138 Addition of peach waste (non-saleable fruit) to the manure provided both sugar and acidity, with 'lactic acid' fermentation (acidophilus bacteria) leading to pH<5 and **solubilisation of >80% of phosphorus**. After removal to recovery of the solubilised phosphorus, >80% of protein was recovered by alkali extraction.

Ari-Matti Seppänen, LUKE Finland, showed trials processing composted to pelletised fertilisers (thermophilic compost of slaughterhouse wastes and other organic materials). The compost was blended with ammonium sulphate and urea. **Over fifty pelletising tests were carried out with compression ratios 4:1 to 8:1**. Pellets with <10% moisture content were produced. Initial conclusions are that pellets with high nutrient content could be produced, compatible with farmers spreading equipment. Crop trials are now planned.