

R&D needs to support nutrient stewardship in EU FP9

Theme / priority	Content
Phosphorus and nutrient flows	Quantitative data on nutrient flows: including within wastewater treatment flows, trends over recent years, nutrient needs to “feed” food production and the bioeconomy. Modelling impacts of policies. Spatial, material and economic feasibility of recycling of different flows. Use of big data to support nutrient stewardship.
	Development of specific regional strategies for nutrient recycling, energy, heat, waste valorisation.
Recycling organic carbon and nutrients	Contaminants * § in organic secondary materials (e.g. pharmaceuticals in sewage sludge, manures ..., microplastics, hydrocarbons) - data base, risk assessment* - impacts on microbiomes - mitigation/removal in treatment-recycling (composts, digestates ...) – evidence base for appropriate & safe use
	Interactions between nutrient recycling and organic carbon recycling to soil (4/1000 Paris commitment), soil carbon-water and soil nutrient-carbon interactions
Social acceptance of nutrient recycling and the food industry	Social and food industry acceptance* of secondary raw materials from bio-wastes – creating market demand – drivers and barriers to nutrient and organic carbon recycling, including regulation – insurance of “contaminant risk”
	Phosphorus footprint – dietary choices – phosphorus in food – including nutrient stewardship into food industry sustainability criteria
Nutrient delivery to agriculture	New fertilisers / fertiliser delivery which improve agronomic efficacy, plant uptake and reduce losses – new business models for delivering crop productivity (service rather than product, holistic approach soil – nutrients – crop)
	Technologies to produce bespoke recycled nutrient products, tailored to specific regional farmer / crop needs* or with specific organic carbon – nutrient balances – soil interactions of P with K, Ca, Mg, micronutrients
	Life cycle analysis* of nutrient recycling compared to primary mineral fertiliser production
Agricultural practices for nutrient efficiency and reducing nutrient losses	Agronomy “feed the plant not the soil” – nutrient leaching* – soil carbon* - catchment management of legacy P stores - influence of soil type and climate
	Agricultural BEMP for phosphorus management – updating of knowledge base and information for farmers and policy makers - social science around farmer engagement in best management practices
	Precision farming application of recycled nutrient materials*: remote sensing, translation to yield and crop N content, combination with other monitoring tools - on-farm tools for nutrient content determination of manures and organic secondary materials*
	Nutrient stewardship in aquaculture
Industrial applications, processes, value chains	Phosphate rock and phosphorus (P ₄) as a Critical Raw Material – innovation in recycling of secondary phosphorus sources into industrial applications to replace mineral P inputs, in production of white phosphorus (P ₄)**. Including P-recovery from mine wastes (iron ore tailings) and processing residues (phosphogypsum)
	Decadmiation technologies, technologies for removing contaminants from sewage sludge incineration ash
	Development & demonstration of routes from secondary materials to EU-label Fertiliser products, including upstream separation of cleaner materials (e.g. biomass), reduction at source of contaminants
	New phosphorus recycling technologies
	Support for quality and standards of recycled nutrient products ***, including characteristics of organic carbon in secondary fertiliser products
Wastewater treatment: Implementation of very low P discharge limits in sewage treatment, including in small sewage works – interactions with energy consumption, biosolids generation, contaminants, organics; combination of new energy efficiency approaches in wastewater treatment with nutrient and carbon recycling	
Eutrophication remediation	Eutrophication remediation, in particular of lakes and enclosed seas (esp. Baltic) - nutrient removal and recovery from lake and marine waters, inflows and sediments – assessing quantities and understanding behaviour of internal P storages, interactions with different forms of P loadings and impacts on eutrophication. Impacts of climate change.
	Holistic catchment nutrient management through e.g. emissions trading or catchment permitting – linking biological and landscape parameters (Water Framework Directive) to chemical nutrient parameters in water and soil

§ = Joint position already agreed with Eureau, EBA, ECN, ECOFI, Growing Media Europe, EEB

* = Included in EIP-AGRI Focus Group 19 recommendations for R&D needs

** = P₄ (white phosphorus) added to EU Critical Raw Materials List 13th September 2017

*** cf. CEN/CLC/BT/JWG 11 (2017-2018 underway) Sustainable chemicals (DG GROW mandate: Identification of potential needs of standardisation for sustainable chemicals from primary and secondary raw materials related to the circular economy action plan)