

Summary of R&D project policy proposals on nutrient circular economy,

Context

The newly elected European Commission (EC) will likely intensify its efforts to enhance nutrient management, particularly focusing on the recovery and sustainable use of phosphorus and nitrogen via the newly revised Urban Wastewater treatment directive ([UWWTD](#)) and a plan for a [new circular economy](#) act. Already in place is the European Green Deal and its associated strategies, such as the Farm to Fork strategy or the Integrated Nutrient Management Action Plan ([INMAP, still not in place yet](#)).

Several EU-funded projects under the Seventh Framework Programme, Horizon 2020 and Horizon Europe have provided policy recommendations to enhance nutrient management, particularly focusing on the recovery and sustainable use of nitrogen and phosphorus. Some of these recommendations are already implemented within the documents mentioned, others are yet to be recognised by the European Commission.

ESPP has asked via direct email to its research project inventory (around 600 projects, October 28th 2024) and in its [newsletter](#) (eNews 91, October 26th) that R&D projects (communicate their policy recommendations regarding nutrient management. From the over 34 reports received, the following aspects are the key messages for the new European Commission. They are summed-up in categories, as there were multiple recommendations given. Some individual recommendations are listed at the end of this summary to highlight the variety of suggestions given.

Regulation and regulatory aspects

The European Union (EU) has established regulations to manage nutrient use, particularly phosphorus and nitrogen, and to promote the use of recycled fertilizers, such as the Nitrates Directive ([91/676/EEC](#)), the Urban Wastewater Treatment Directive ([91/271/EEC](#)) and the Common Agricultural Policy (CAP). Alongside the Fertilising Products Regulation ([EU 2019/1009](#)) and the Sewage Sludge Directive ([86/278/EEC](#)) these regulations collectively aim to enhance nutrient efficiency, reduce environmental pollution, and encourage the recycling of nutrients within the EU, contributing to sustainable agricultural practices and environmental protection.

Ref	Proposal	Relevant regulations	ESPP comments
13	Encourage precision farming for digestate application and ensure adequate storage for vegetation periods.	CAP	
13	Require biogas plants to include groundwater and surface water monitoring as part of their permit conditions. Develop uniform rules for maximum phosphorus application rates based on best practices. Include nutrient recycling targets in building permits and recommend selling digestate to deficit areas	CAP	
15	Use the Common Agricultural Policy (CAP) to provide financial support for storage facilities, equipment, and training for farmers transitioning to recycled fertilisers	CAP	
23	Introduce mandatory measures under SMRs or GAECs for circular fertiliser adoption. Encourage voluntary eco-schemes and rural development programmes promoting circular fertilisers.	CAP	
2, 3, 24	Simplify and unify EU regulations on recycled nutrients to avoid contradictory interpretations by different Member States. This would enable companies to market secondary phosphorus products across borders and reduce regulatory obstacles that limit innovation and market growth	FPR	The FPR already allow this for secondary nutrients in fertilising products, so there is only a problem for (a) recycling nutrients which are NOT covered by the FPR and (b) recycled nutrients in other applications (e.g. industrial phosphoric acid or phosphorus compounds)

Ref	Proposal	Relevant regulations	ESPP comments
7,8	The European Commission should incorporate the term “bio-based” into the EU Fertilising Products Regulation (Annex III). The R&D projects suggest that this definition should include that BBFs are derived from biomass (excluding fossilised materials), have a minimum nutrient content, and exhibit storability, stability, and low heavy metal content	FPR	See joint stakeholder proposal developed by ESPP (2024) for a definition of “bio-based nutrient”
17, 23, 24	Include further secondary raw materials or recycling processing methods into the Fertiliser Regulation, for instance human excreta [24], sewage sludge and industrial sludge [17] with safety procedures established	FPR	Study is underway to address this for the European Commission (NMI study, see ESPP eNews n°92)
23	The FPR's requirements should be reviewed to establish achievable standards for producers, such as the nutrient content requirement for 'PFC 1(A)(II) Liquid Organic Fertiliser	FPR	It is not established that there is stakeholder support (industry, farmers ...) for such 'weakening' of FPR quality and agromonic value criteria
18,23	In addition to the EU-level FPR criteria, Member States should continue to retain flexible national frameworks for fertilising products to adapt to local conditions	FPR	This is today possible, the FPR allows national fertilising product regulations in addition to FPR criteria. However, some MS are considering aligning their national fertiliser regulations with the FPR.
6, 16	<ul style="list-style-type: none"> - Enhance Clarity in Circular Economy Strategies: Clearly define circular economy concepts and promote cross-sectoral legislative approaches to improve understanding and implementation. - Establish a coordination group involving Member State authorities responsible for waste policy, water policy, and circular economy to align standards 	Circular economy act	
23	Update the directive with stricter heavy metal limits and additional pollutant thresholds to build trust in products derived from sewage sludge, such as struvite and digestate.	Sewage sludge directive (SSD)	Evaluation of SSD is underway
23	Simplify Taxonomy Regulation activities by creating a unified category for nitrogen and phosphorus recycling	EU Taxonomy	EU Taxonomy (EU) 2023/2486 today includes P-recovery from municipal wastewater, not P-recovery from other sources, not N-recovery

Ref	Proposal	Relevant regulations	ESPP comments
23, 25, 26	<p>Replace discriminatory nitrogen application limits for manure with a nitrogen surplus cap encompassing all nitrogen sources.</p> <p>Adjust nitrogen balance calculations to reflect the lower nitrogen use efficiency of circular fertilisers like compost and digestate</p> <p>Manure-derived N-products that meet the ReNure criterion should be exempted from the 170 kg N/ha limit that is imposed on manure application following the Nitrates Directive.</p> <p>Implementation of the ReNure criterion should not be delayed anymore.</p> <p>The Nitrates Directive should be amended to align with other pieces of legislation, especially on the definitions of manure, processed manure, and manure derived products.</p> <ul style="list-style-type: none"> - Before that, DG ENV needs to align with DG GROW and DG SANTE that ammonium salts derived from off-gases of manure or manure treatment processes are not to be interpreted as a manure in processed form under the Nitrates Directive. <p>All materials meeting the RENURE criteria as formulated by the JRC/SAFEMANURE to be included in Annex 2 of the directive. The consistent quality of the RENURE materials is already guaranteed by the introduction of standards for consistent quality at the National level.</p> <ul style="list-style-type: none"> - To avoid confusion, it is recommended that the term 'pro-cessed manure' be replaced by either 'processed manure meeting the requirements of Annex XI of EU regulation 142/2011', or 'manure-derived product', as appropriate. 	Nitrates Directive / ReNure	Proposals to modify the Nitrates Directive were submitted to public consultation in 2024, see ESPP input at www.phosphorusplatform.eu/regulatory
14, 18, 20, 23	<p>Recognise certain bio-based fertilisers (BBFs) recovered from animal manure in EU certified Organic Farming as authorised fertilising products for organic farming [14] and work with CEN (European Committee for Standardization) to create an EU standard defining "bio-based" content for nutrients in fertilisers and other applications [18].</p> <p>Allow national certification of struvite for organic farming and provide clear EU guidance on "factory farming."</p> <p>Shorten delays between approval under general regulation and inclusion in EU certified Organic Farming regulation</p>	Organic farming regulation / bio-based materials	<p>Struvite authorised (under conditions) in certified Organic Farming by (EU) 2023/121</p> <p>EGTOP proposed definition of "Factory Farming" to enable use in certified Organic Farming of certain recycled manure nutrients, 2024, see ESPP eNews n°93</p> <p>Delays and overall ("one-by-one") process for consideration of recycled nutrients in Organic Farming remain an issue (see SCOPE Newsletter n°149)</p>
23	Include nitrogen recovery targets in the UWWTD	UWWTD	Revised UWWTD refers only to a study on N-recovery
23	Publish an EU nutrients strategy (INMAP = integrated nutrient management action plan) to establish a holistic framework for nutrient management, encourage circular fertiliser adoption, and drive innovation	INMAP	

Ref	Proposal	Relevant regulations	ESPP comments
9	Cascade national bio-waste recycling targets down to the municipal level with responsibility for waste collection systems and ensure that there are consequences for municipalities that fail to meet targets.	Waste framework directive	National laws state the transfer of the EU objective to regions, thereby giving the capacity to regions to decide how to transfer the objective to the local level. This will tend to happen in MS anyway. National Governments do not wish to pay EU penalties for non-compliance, so will ensure that these are cascaded down to local authorities

Market

While the regulatory environment supports the use of recycled fertilizers, challenges remain, including public perception, variability in nutrient content, and potential contaminants. The EU tries to foster a conducive environment for the growth of the recycled fertilizers market, integrating waste management with sustainable agricultural practices to achieve environmental and economic benefits. To have level-playing field in the fertiliser market, R&D projects are giving the following recommendations:

Ref.	Proposal	ESPP comments
1	Simplified market routes for recovered resources: To create effective EoW pathways for all materials recovered from wastewater and sludge, an alternative process within the updated UWWTD could act as a streamlined, one-stop solution, managing risks. Additionally, ensuring that EoW status is recognised across multiple Member States would reduce costs and risks, making circular schemes more accessible and feasible	FPR provides EU EoW for fertilising product applications EoW is a widely cited problem of non-fertilising product applications of recovered nutrients.
3,24	Efficient phosphorus recovery systems need stability in legal frameworks to support new market players and investments	
3,24	Provide substantial financial support for demonstration plants to accelerate implementation, foster product market development, and provide policy insights.	
8	provide accurate, easily accessible data, fostering stakeholder confidence, and driving demand for BBFs. Link BBF pricing to carbon content (connection to AgETS) and align with the European Commission's initiatives on agricultural emissions and climate-friendly practices	
10	Policy targets should only consider nutrient recycling where the recovered material is a market-ready products and ensure recycled phosphorus fertilisers are safe, compliant with regulations, and tailored to agronomic needs	
11, 14	Develop financial incentives to lower entry barriers for (organic) phosphorus fertilisers and integrate nitrogen and carbon considerations	
13	Markets for Recycled Nutrients <ul style="list-style-type: none"> - Establish long-term goals for recycled nutrient use in agriculture, supported by national development plans - Voluntary Quality Schemes: Enhance public trust through transparent quality assurance for recycled products through additional voluntary actions. - Include nutrient recycling efficiency in tenders for biowaste and sewage sludge management services 	

Ref.	Proposal	ESPP comments
14	Standardise monitoring and analysis of natural inputs for more precise policy and market decisions	
16	Set up an incentive for marketing firms to identify and develop niche markets for bio-based resources (where consumers are willing to pay premium prices), moving away from commodity markets	
23	European nutrient recycling targets - Introduce minimum recycled nutrient usage targets for fertilisers - Mandate the use of recycled organic matter in growing media, replacing traditional materials like peat	
23	Fiscal tools for sustainable nutrient management: Implement reduced VAT rates for recycled nutrients, eco-taxes on primary nutrients in synthetic fertilisers. Extend ETS benefits to farmers using low-CO2 fertilisers, enabling food retailers to prioritise low-carbon products and supporting climate goals.	

Stakeholder engagement

Stakeholder engagement fosters collaboration and trust by ensuring diverse perspectives are included in decision-making processes – a valid statement, also in nutrient management, as most of the projects highlighted in their recommendations towards policy, as it creates a sense of ownership and accountability. Positive engagement strengthens relationships, resolves conflicts efficiently, and drives sustainable outcomes that benefit all parties involved. The recommendations can be summed up as [3, 4, 5, 6, 8, 9, 10, 11, 13, 16, 18]:

- Engage and Involve stakeholders to promote a mutual understanding
- Enhance communication

With some exemplary aspects, such as:

Ref.	Proposal	comment
10	Develop a collective vision involving farmers, the fertiliser industry, and communities to enhance policy design and implementation	
10, 11	Educate stakeholders on phosphorus sustainability and its importance in food systems to drive behavioural change with public awareness campaigns. One example could be marketing campaigns to assist in establishing new social norms, change food purchase behaviour and encourage sustainable consumer choices	
11	Offer training and advisory services to farmers to enable the transition to sustainable nutrient management	

Research

Statements to sustain funding for nutrient management research and related demonstration projects in general [1, 2, 4, 9, 10, 15] are accompanied with specific recommendations regarding agronomic aspects, data management and collaboration and safety of recycled materials:

Ref.	Proposal	comment
2, 7	Conduct (Long-term) agronomy research into phosphorus use efficiency in crops and farming practices to reduce P-losses, including demonstration, outreach and training for farmers [2] Additionally, fund long-term field trials to validate the agronomic efficiency of bio-based fertilisers, especially given their heterogeneous composition and distinct nutrient release patterns [7]	
2	Phosphorus flow studies based on real monitoring data (mass flows, characteristics), targeted to identify points for P-recovery implementation and phosphorus management	
3	Maintain updated project result databases to track research impacts	
3	Protect intellectual property to boost EU-wide innovation	
3	Ensure technological projects generate actionable policy recommendations aligned with EU policies like Farm-to-Fork	
4	Enhance collaboration and participation from underrepresented EU countries to build bridges across the research and innovation ecosystem	
11, 15	Support further development and research for the agricultural systems and their environmental and climate impacts to build a robust data base. [11] and evaluate yield efficiency, soil health, and environmental safety in different regions and climates. [15]	
15	Map nutrient needs and resource availability to optimise the location of nutrient recycling plants	
15, 16	Prioritise research on the safety of recycled fertilisers, addressing concerns such as contaminants and microplastics, to increase acceptance among farmers	

References

Ref.	Project / Publisher	Dates	Document name	Link
1	NextGen – Towards a next generation of water systems and services for the circular economy	07/2018 – 11/2022	NextGen policy brief: Solutions for a Water-Smart, circular and resilient Urban Wastewater Treatment and Sewage Sludge Directives	https://nextgenwater.eu/wp-content/uploads/2022/10/20221004_nextgen_PolicyBrief_Brochure_singlePages_WEB.pdf
2	European Commission	2015	Circular approaches to phosphorus - From research to deployment	https://op.europa.eu/en/publication-detail/-/publication/a78acc80-f3d0-4bde-b2f7-e8a7402b43d3
3	European Commission	2023	Systemic approach preventing pollution from nitrogen and phosphorus	https://op.europa.eu/en/publication-detail/-/publication/dcae28b0-4e08-11ee-9220-01aa75ed71a1/language-en

Ref.	Project / Publisher	Dates	Document name	Link
5	TOMRES	06/2017 – 05/2021	D6.5 – TOMRES opinion paper concerning research policy and regulatory issues	https://cordis.europa.eu/project/id/727929/results
6	FATIMA – Farming Tools for external inputs and water management	03/2015 – 02/2018	D 4.2.4 - Recommendations for policy	http://fatima-h2020.eu/wp-content/uploads/2015/07/D-4_2_4.pdf
7	NextGen	07/2018 – 11/2022	NextGen: Stakeholder engagement in the circular water economy – 2022	https://nextgenwater.eu/wp-content/uploads/2022/11/20221129_nextGen_PolicyBrief_SinglePages_WEB.pdf
8	Lex4Bio, Fertimanure, Sealand, Rustica, Walnut	2024	Bio-based Fertilising Products: Quality, safety and alignment with EU Regulation A Joint Position Paper of the 5 RUR-08 Sister projects	https://walnutproject.eu/wp-content/uploads/2024/07/H2020-projects-jont-position-paper-QUALITY-recycled-nutrients.pdf
9	Lex4Bio, Fertimanure, Sealand, Rustica, Walnut	2024	How to boost bio-based fertilisers (BBFs) in the European market	https://walnutproject.eu/wp-content/uploads/2024/07/H2020-projects-jont-position-paper-PRICING-recycled-nutrients.pdf
10	LIFE-BioBest: Guiding the mainstreaming of best biowaste recycling practices in Europe	01/2023 – 06/2025	D5.2: Policy brief including the regulatory barriers	https://zerowasteurope.eu/wp-content/uploads/2024/02/240214_LIFE-BIOBEST_WP5_D5.2_PolicyBriefBarriers_submitted_web.pdf
11	RePhoKUs report	2022	UK Phosphorus Transformation Strategy: Towards a circular UK food system	https://zenodo.org/records/7404622
12	CIRCULAR AGRONOMICS - Efficient Carbon, Nitrogen and Phosphorus cycling in the European Agri-food System and related up- and down-stream processes to mitigate emissions	09/2018 – 02/2023	D6.7 Policy note	https://www.kompetenz-wasser.de/media/pages/forschung/publikationen/d6-7-policy-note/09790ccb3d-1702634142/circularagronomics-d6.7-e-2911-policy-note-fin.pdf
13	ReFresh - Resource Efficient Food and drink for the Entire Supply chain	07/2015 – 06/2029	D3.5 policy recommendations	https://eu-refresh.org/sites/default/files/D3.5%20Policy%20recommendations_v.2.pdf
14	Sustainable Biogas	2020 - 2022	Recommendations For Biogas production from Sustainable Biogas project	https://johnnurmisensaatio.fi/en/our-work/projects/sustainable-biogas/
15	RELACS: Replacement of Contentious Inputs in organic farming	05/2018 – 04/2022	D7.3: Policy brief explaining the organic approach to inputs	https://relacs-project.eu/
16	RELACS: Replacement of Contentious Inputs in organic farming	05/2018 – 04/2022	D7.5: European Roadmap for phasing in new nutrient sources	https://relacs-project.eu/

Ref.	Project / Publisher	Dates	Document name	Link
17	European Commission	2019	H2020 Water Innovations for Sustainable Impacts in Industries and Utilities	https://water2return.eu/wp-content/uploads/2020/02/WaterInnovationReportI-WARR2019.pdf
18	P2Green – Turning human sanitary waste into fertilizer	01/2022 – 12/2026	D3.7 “Scoping review” describing the status of the legislative framework, Closing the gap between fork and farm for circular nutrient flows	https://p2green.eu/wp-content/uploads/2024/03/D3.7-Scoping-review-describing-the-status-of-the-legislative-framework.pdf
19	P2Green – Turning human sanitary waste into fertilizer	01/2022 – 12/2026	D6.7 Policy brief – midterm, closing the gap between fork and farm for circular nutrient flows	https://p2green.eu/wp-content/uploads/2024/03/D3.7-Scoping-review-describing-the-status-of-the-legislative-framework.pdf
20	P2Green – Turning human sanitary waste into fertilizer	01/2022 – 12/2026	Resource-oriented sanitation: Closing the gap between fork and farm for circular nutrient flows – 2024	
21	Fertimanure	01/2020 – 06/2024	Position paper on increasing the scope of bio-based fertilisers for organic farming	https://www.fertimanure.eu/documents/fertimanure-position-paper-on-increasing-the-scope-of-BBFs-for-being-used-in-organic-farming.pdf
22	Multisource - ModULar Tools for Integrating enhanced natural treatment SOlutions in URban water CyclEs	06/2021 – 05/2025	Integrated nature-based solutions for water-smart cities	https://cordis.europa.eu/project/id/101003527/results
23	Fer-Play: Multi-assessment of alternative fertilisers for promoting local sustainable value chains and clean ecosystems	09/2022 – 02/2025	D2.2 Multi-assessment of impacts, trade-offs and framework conditions	https://fer-play.eu/resources/#1684766582013-ddd5323e-5bfe
24	P-Rex: Sustainable sewage sludge management fostering phosphorus recovery and energy efficiency	09/2012 – 08/2015	Policy brief	https://arquivo.pt/wayback/20160107222856/http://p-rex.eu/
25	Joint Feedback on the Nitrates Directive Evaluation of European Research Projects	08.03.2024	report	https://www.biorefine.eu/publications/joint-feedback-on-the-nitrates-directive-evaluation/
26	Joint Feedback of EU research projects on the Draft amendment of Annex II of the Nitrates Directive	17.05.2024	report	https://www.nmi-agro.nl/wp-content/uploads/2019/09/EU-research-projects-Joint-Feedback-on-amendmend-ND-annex-II-RENURE.pdf

Additional literature used

Project / Publisher	Date	Document name
Multisource - ModULar Tools for Integrating enhanced natural treatment SOLutions in URban water CyclEs	06/2021 – 05/2025	Integrated nature-based solutions for water-smart cities
COST Action CA17133 Circular City	08.09.2019	Towards Circular Cities Workshop organised by the
FATIMA – Farming Tools for external inputs and water management	03/2015 – 02/2018	D4.1.1: Framework for Water- Energy- Food assessment in pilot areas
FATIMA – Farming Tools for external inputs and water management	03/2015 – 02/2018	D 4.2.3 Policy Analysis Report
J. Martin-Ortega in: Environmental Science and Policy 131	2022	Are stakeholders ready to transform phosphorus use in food systems? A transdisciplinary study in a livestock intensive system
J. Martin-Ortega in: Environmental Science and Policy 162	2024	Transforming the food system: Are farmers ready to take phosphorus stewardship action?
Susinchain – sustainable insect chain	18 July 2023	Sectoral roadmap and policy recommendations for supporting large-scale commercialisation of high-quality insect products in Europe
Phosv4eu - project	2023	V4's resilience in the face of pandemic in raw materials & food sector