# ESNI CONFERENCE

## Growing the Future of Nutrient Recycling

**18 & 19 September 2024**
**Brussels, Belgium**

ESNI
EUROPEAN SUSTAINABLE NUTRIENT INITIATIVE

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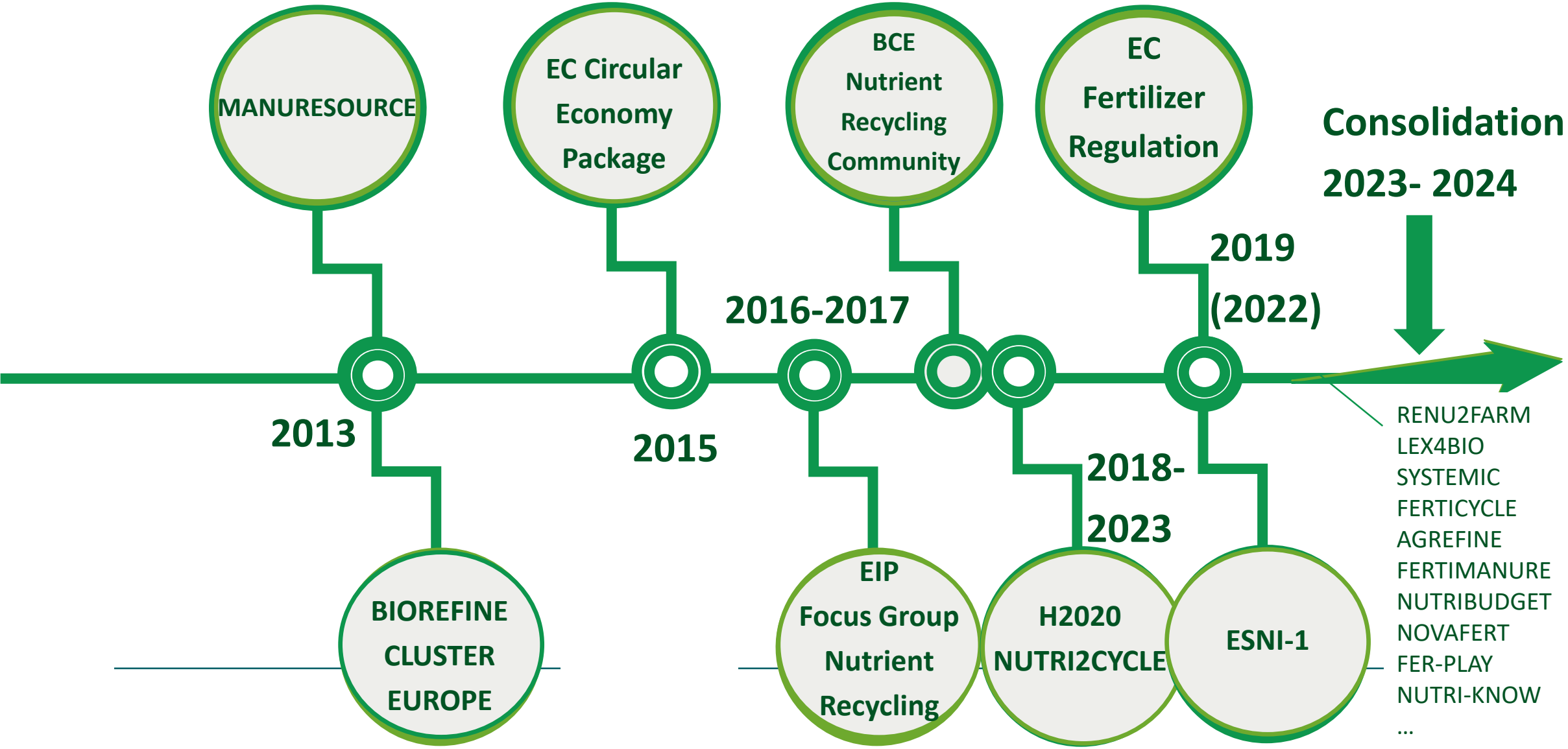
# The history of ESNI, its Working Groups and plans for the future

# ESNI COMMUNITY: THE JOURNEY



# ESNI COMMUNITY: OBJECTIVES AND ACTIVITIES

Nutrient Recycling Community was taken under the umbrella of the well recognized European Sustainable Nutrient Initiative (ESNI) going beyond annual conference

## Mission:

- Foster collaboration among European entities in nutrient recycling.
- Facilitate experience exchange and identify knowledge gaps to guide future research.
- Enhance partnerships among stakeholders (private sector, policymakers, society).
- Contribute to advancing nutrient recycling technologies and knowledge.

## Vision:

- Establish ESNI as a leading research reference in Europe for nutrient-related challenges.
- Facilitate the adoption of research and innovation in nutrient recycling through member expertise.

# ESNI COMMUNITY: OBJECTIVES AND ACTIVITIES

## Goals:

1. Encourage collaboration across Europe in nutrient recycling.
2. Identify challenges from EU strategic documents.
3. Understand private sector needs (fertilizer industry, farmers, tech providers).
4. Propose new research initiatives.
5. Promote adoption of existing innovations.
6. Communicate research results to stakeholders.
7. Foster collaborative research at the EU level.
8. Provide insights and support to policymakers and the private sector.
9. Assist in policy recommendations at regional, national, and EU levels.

# ESNI COMMUNITY: OBJECTIVES AND ACTIVITIES

## What kind of activities does ESNI promote?

- The annual event “ESNI Conference” associated with the annual ESNI General Assembly for the community members. Maintains its interconnection with the brand Biorefine Cluster Europe.
- Topic focused webinars
- Workshops and roundtables
- Joint activities and initiatives between projects (joint publications and experiments, staff exchange, joint proposals, etc.)
- Digital media (webpage, bulletin, social media, e-library)
- Participation and contribution as ESNI community in relevant events and conferences

# ESNI COMMUNITY: PROJECTS INVOLVED

## More than 20 projects are already part of ESNI community


Interreg North-West Europe Co-funded by the European Union
ReNu2Cycle

ALGONET

NINFA

BBioNets
Boosting the adoption of Bio-Based Technologies

NENUPHAR
Nutrients recycling and pollution handling

Novafert

ferplay

BYPROTVAL

CHEERS

AlgaePro BANOS

BioReCer

NutriBudget

MicroAlgae 4.0

Interreg North-West Europe BIOWILL

model2bio
waste-to-feedstock

LemnaPro

NUTRI•KNOW

BioDEN

WALNUT

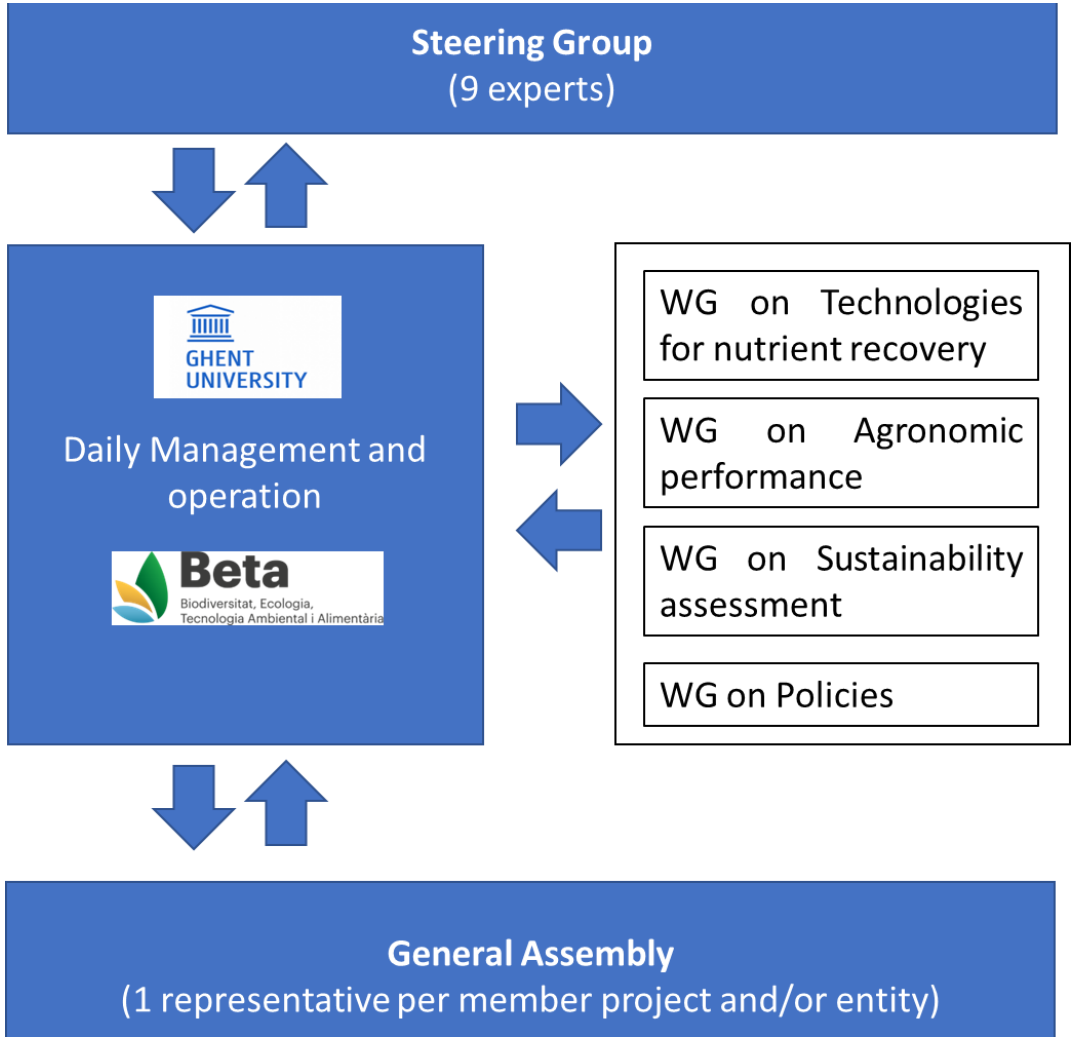
ULTIMATE
WATER SMART INDUSTRIAL SYMBIOSIS

SEALAND

LEX4BIO

REFLOW
EUROPEAN TRAINING NETWORK

# ESNI COMMUNITY: ORGANISATIONAL STRUCTURE



# ESNI COMMUNITY: ORGANISATIONAL STRUCTURE

**ESNI STEERING GROUP**

**Erik Meers, UGENT**

**Evi Michels, UGENT**

**Ana Robles, BETA TC**

**Ludwig Hermann, PROMAN**

**Lucile Sever, EBA**

**Kimo van Dijk, WENR**

**Inès Verleden, INAGRO**

# ESNI COMMUNITY: ORGANISATIONAL STRUCTURE

**ESNI Working Group leaders**

**WG Technologies**

**Nagore Guerra, BETA TC**

**WG Agronomic performance**

**Kari Ylivainio, LUKE**

**WG Sustainability**

**Jorge Senán, BETA TC**

**WG Policy & Market pathway**

**Laura van Schöll, NMI**

# ESNI COMMUNITY: ORGANISATIONAL STRUCTURE

The ESNI community set up **4 Working groups**, led by European projects, discussing **major challenges** with an **impact on the nutrient recycling and recovery**.

**4 Working Groups:**

- **Technologies** for nutrient recycling coordinated by FERTIMANURE;
- **Agronomic performance** of fertilising products coordinated by LEX4BIO;
- **Sustainability assessment** coordinated by NOVAFERT;
- **Path to market** coordinated first by Nutri2Cycle and currently led by ReNu2Cycle.

# ESNI COMMUNITY: WGs ACTIVITIES

**Organisation of several on-line webinars**

- Initial Webinars for the 4 Working Groups.
- Lexicon webinar.
- Field trial of biobased fertilizers.
- Quality and risk assessment of bio-based fertilisers.
- Webinar series on the widely known/implemented technologies used for nutrient recovery:

  Stripping-scrubbing
  Membrane-based systems
  Algae-based systems
  Anaerobic digestion
  Thermal treatments

- Manure innovation agenda

# ESNI COMMUNITY: WGs ACTIVITIES

- Biogenic Carbon accounting

- Webinars and Joint Policy feedback papers on:
  - Legal status Ammonium salts from stripping/scrubbing off-gases of manure processing
  - Proposal for the uptake of processed manure as a CMC 10 component under the FPR.
  - Soil Health Directive proposal.
  - Upcoming Evaluation of Nitrate Directive.
  - Proposal for RENURE materials under the Nitrate Directive.

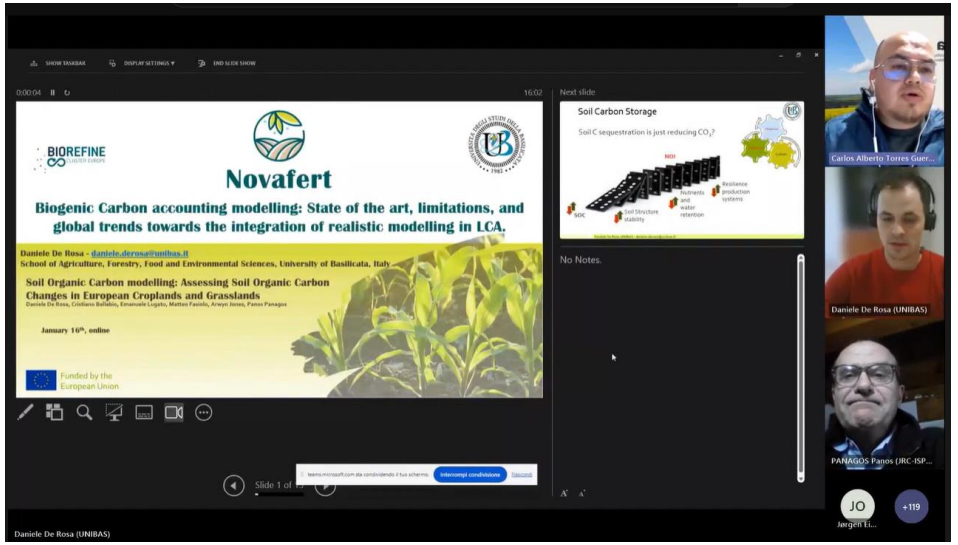
# ESNI WEBINAR- Biogenic carbon in LCA

- Chairman: Carlos Alberto Torres, from UVIC
- Co-chair: Jorge Senán, from UVIC
- Organization: Hans, from Impact

Biogenic Carbon accounting modelling in bio-based fertilisers: State of the art, limitations, and global trends towards the integration of realistic modelling in LCA

Top level pannelists

- Daniele De Rosa, University of Basilicata (Italy)
- Panos Panagos, JRC, European Commission (Italy)
- Jørgen Eivind Olesen, Aarhus University (Denmark)
- Massimo Pizzol, Aalborg University (Denmark)
- Christhell Andrade, University of Toulouse (France)




Available at: https://www.youtube.com/watch?v=x_vPDQiNOiE

Up to 180 participants!

# Webinars series at SG-NRC-BC

- Objective of the webinars:
  - To have a vision of the LCA community of which are the challenges and potential solutions and perspectives to solve them out.


- Channels: Sustainability group of the Nutrient Recycling Community
- Collaborators: LUKE, IMPACT & UGhent (WP6)
- Tentative dates: To be rescheduled

- Tentative 3 webinars
  - Impacts and trade-offs of BBFs application in biodiversity (Q4 2024)
  - Nutrient impact in the application: emissions modelling of and yields in LCA (2025)
  - Experiences of LCA in bio-based and mineral fertiliser industry (2025)

# ESNI COMMUNITY: WGs ACTIVITIES

**Collaboration with other events**

- ManuResource 2024

  Organisation of 4 round tables (one for each WG), to discuss main future challenges in the different topics.

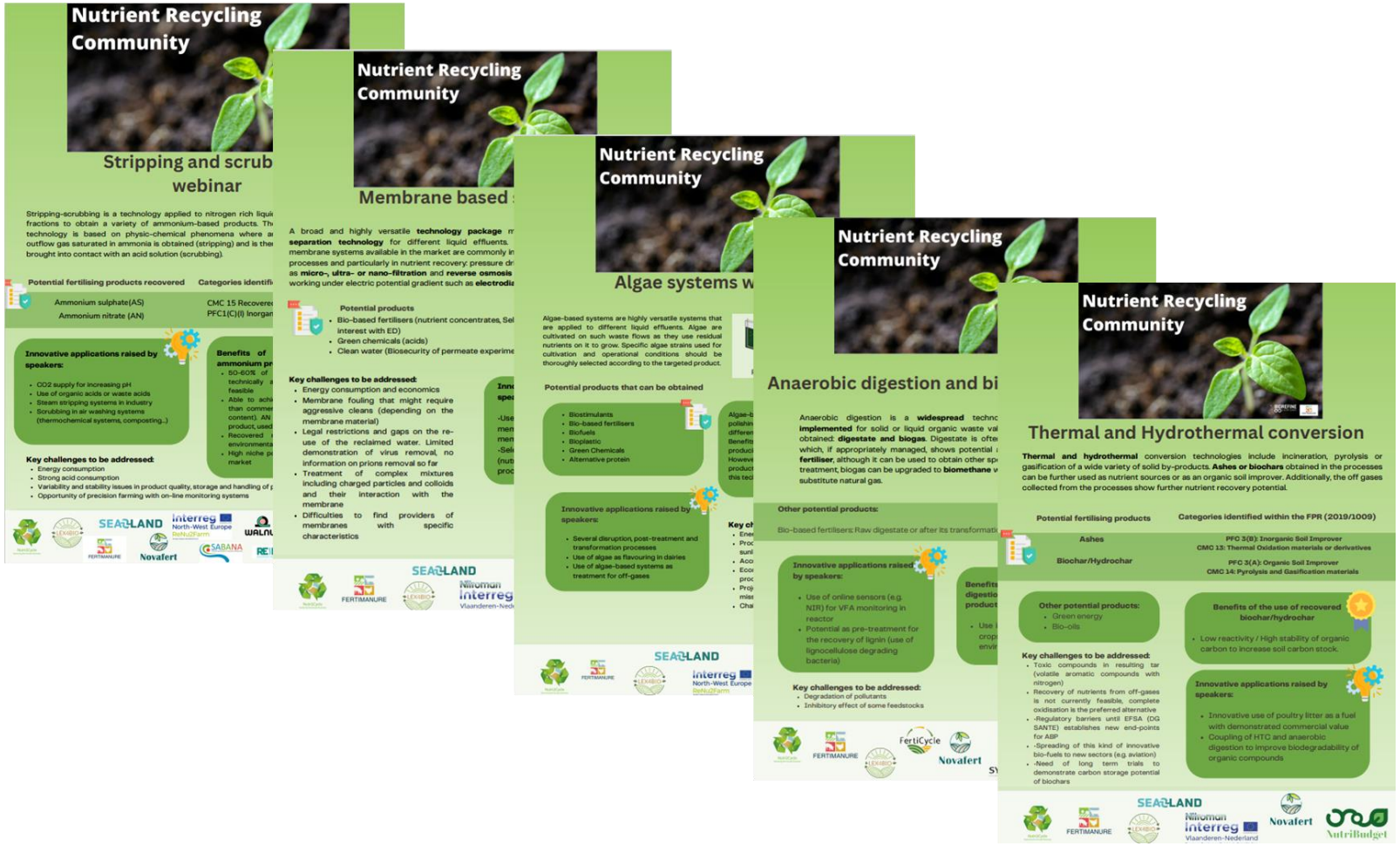
- Nutrients in Europe Research Meeting 2024

  PhD session.

- The 9th Agriculture Green Development Online Symposium. Sino-Dutch AGD project semi-annual meeting.
- ADD OTHERS

# ESNI COMMUNITY: MAIN OUTCOMES

## Nutrient Recovery Technologies Factsheets



# ESNI COMMUNITY: MAIN OUTCOMES

## Joint Position Papers

Interreg Co-funded by the European Union
North-West Europe
ReNu2Cycle

**FEEDBACK on draft text for COMMISSION DELEGATED REGULATION (EU) .../... of XXX a Regulation (EU) 2019/1009 of the European Parliament and of the Council as regard processed manure as a component material in EU fertilising products**

Background

The EU has made huge progress in the implementation of circular economy solutions. W legal framework within the Circular Economy package (FPR, WFD, CAP-Farm to Fork) and a c commitment to invest in research (H2020) and practical implementation (INTERREG) the and use of nutrients from wastes and residues is stimulated and facilitated.

The NWE Interreg project ReNu2Cycle aims to encourage the use of recovered nutrients in Europe in the form of recycling-derived fertilisers. We welcome the continuous wor inclusion of new materials in the FPR. With this feedback we want to contribute to the impr of the text for the inclusion of processed manure as a CMC 10 component in the FPR.

Ad 1. Unclear description of the component material

Processed manure that has reached an end point according to ...

Processed manure is a term that is defined differently in several relevant pieces of legislatio with manure application. In the EU regulations on Animal by-products , processing is unde be hygienisation process, whereas in the Nitrate directive it is understood to be any treatment.

- **The Animal by-product regulation** EC 1069/2009 art 3.20defines manure as: *'Manure 'means any excrement and/or urine of farmed animals other than farmed fis without litter'* .
  The regulation further distinguishes processed manure and manure-derived products *Processed manure:* manure treated with one of the sanitation methods mentioned in t IV of EU 142/2011.
  *Manure-derived product:* products obtained from one or more treatments, transform steps of processing of manure;
- **Nitrate Directive** art. 2.g defines manure in a different way
  *'livestock manure': 'means waste products excreted by livestock or a mixture of litter a products excreted by livestock, even in processed form;*
  In this definition, processed manure means any product that is obtained from including nutrients and carbon recovered from the manure, even in a pure mineral fo

**We suggest that this is clearly explained in the FAQ document on the FPR.**

**Joint Feedback on the Nitrates Directive Evaluation of European Research Projects**

**About the European Research projects**

We welcome the opportunity to give feedback on the Evaluation of the Nitrates Directive.

The EU has made enormous progress in the implementation of circular economy solution to a continued commitment to research (2020) and practical implementation (INTERREG recovery and use of nutrients from wastes and residues is stimulated and facilitated. This is with the new legal framework within the Circular Economy Action Plan (CEAP)[1] (FPR, WFD Farm to Fork) under the EU Green Deal[2].

The European Commission has mandated and demanded a number of EU projects different frameworks (H2020, Horizon Europe, INTERREG) to provide both Europe and the E scientific technical evidence and policy-oriented advice, on topics related to circular econo general and nutrient (re)cycling in particular. In this light, the projects subscribing to the c call feedback call, have joined forces to provide the following Feedback letter. Our fee compiled feedback is based on the insights from the various project activities.

The Biodiversity[3] and the Farm to Fork[4] strategies set a common objective of reducing nu losses in the environment by at least 50% by 2030, while preserving soil fertility. Council Dir 91/676/EEC[5] concerning the protection of waters against pollution caused by nitrates agricultural sources ("the Nitrates Directive") is a key piece of legislation to achieve this targ other objectives of the EU Green Deal[2].

The Nitrate Directive has been introduced more than 30 ago and has not been amended Whereas the goal of the Directive remains relevant, the Directive itself urgently needs aligned with other legislation such as the Fertilising Product Regulation and the Animal By-P Regulation, Nitrates Directive.

The current wording and strict interpretation of the definition of livestock manure, and the of the flagship achievement ReNure are seriously obstructing the market entry and use of va recycled N-fertilising products. Moreover, it also counteracts other EU goals for circularity th laid down in other pieces of EU law.

1 COMMUNICATION FROM THE COMMISSION - A new Circular Economy Action Plan for a cleane more competitive Europe COM/2020/98 final
2 Communication from the Commission - The European Green Deal, COM/2019/640 final
3 Communication from the Commission - EU Biodiversity Strategy for 2030 - Bringing nature back our lives, COM/2020/380 final
4 Communication from the Commission - A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system, COM/2020/381 final
5 Council Directive (91/676/EEC) concerning the protection of waters against pollution caused by nitrates from agricultural sources

**Joint Feedback of EU research projects on the Draft amendment of Annex II of the Nitrates Directive**

We welcome the opportunity to give feedback on the draft amendment of the Annex II of the Nitrates Directive.

We support the first significant amendment of the Nitrates Directive in more than 30 years. The implementation of the RENURE criteria is long awaited and is certainly a big step forward in aligning the Nitrates Directive with technological achievements that have been made since the introduction of the Nitrates Directive.

We are however concerned that some of the additional criteria and requirements -that are introduced in the draft proposal- will hamper the introduction of RENURE materials in the field. Our feedback and recommendations are brought forward to improve the proposed text for the amendment and to contribute to the overall goal of the Nitrate Directive, which is undisputed.

**Recommendations from European Research projects**

**RENURE implementation should not be postponed by the evaluation of the Nitrate Directive**

We are disappointed by the continuous postponement of the full implementation of the RENURE criteria. The RENURE report has been published in 2020, with clearly defined criteria for RENURE materials. Since then, implementation was delayed as no decision could be reached on how to bring these into practice as: part of derogations, part of the national action plans or with harmonised rules at the EU level.

By making the RENURE implementation part of the evaluation process of the Nitrates Directive, the implementation is postponed again, without any justification. The need for RENURE has been established years ago and has led to the SAFEMANURE project, which resulted in the RENURE criteria.

Because of this history and the criteria that have been formulated in the SAFEMANURE project, it is desired and judicious to implement RENURE in the short term. For that reason, we plea for implementation of the full unrestricted RENURE criteria apart from the evaluation of the Nitrate Directive.

We recommend a full implementation of the RENURE criteria independent of the evaluation of the Nitrates Directive.

**Limitation of RENURE implementation to only three materials is unjustified**

We disagree with the restrictive implementation of just three specific materials. These materials have been selected based on the criterion that they would *'reliably yield materials of a consistent quality in accordance with specified criteria'*. We are surprised that this new criterion has been put forward four years after the conclusion of the SAFEMANURE project and the JRC report on RENURE.

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# ESNI COMMUNITY: MAIN OUTCOMES

## Current knowledge and identified knowledge gaps – Recommendations for future R&D activities

### Technologies for nutrient recycling

**Context at EU level**

Continuous development of Nutrient recycling technologies has led to the technical consolidation of various processes. However, improvements and optimization are needed to maximize their cost-effectiveness and enhance the obtained bio-based fertilizers (BBFs) quality. These include better pre-treatment and post-treatment steps and regulatory adjustments to uptake waste-derived BBFs. Adapting technologies to regional contexts, considering specific feedstocks, market needs, and available providers, is essential.

**What has been learned?**

- Technical viability of technologies demonstrated
- Attractive products can be recovered with demonstrable quality and safety parameters
- Generation of significant volume of by-products that need to be managed afterwards
- Energy- efficiency of technologies as main bottleneck
- Overall, low nutrient concentration in recovered products

**Identified knowledge gaps**

| Fundamental gaps | Applied gaps |
|---|---|
| • Harness, consolidate and unify the data available<br>• Improve performance to enhance mass-efficiency and more concentrated products | • Cost-effectiveness in scaling up<br>• Integration of regional and sectorial differences to tailor nutrient management strategies |

**Key topics to be tackled in future working program**

- Increased replicability and scalability of circular systemic solutions at regional level
- Demonstration of the solutions feasibility at a large scale (Flagship projects)
- Cost-effectiveness: energy efficiency, maximise recovered products and quality
- Demonstration of long-term viability of the proposed solutions to maximise the adoption of the solutions
- Capitalization of all the generated knowledge and efficient transfer to key stakeholders
- Ensure an efficient adoption of the proposed solutions to end-users
- Compilation of the information generated in robust databases to develop decision supporting tools

### Agronomic performance of BBFs

**Context at EU level**

Substituting conventional inorganic fertilisers with novel biobased fertilisers (BBFs) produced from various organic waste and side streams promotes the circular economy and can potentially reduce environmental and climate impacts of fertiliser production and use. Due to the large variability of chemical and physical properties of BBF, their agronomic efficiency may vary depending across Europe due to the variation in climatic conditions, crop requirement and soil properties.

**What has been learned?**

- BBFs can compete in terms of quality with conventional fertilising products, offering similar crop yields and similar environmental performance in terms of emissions (soil, water and atmosphere)
- Most of the European demand (86%) for P fertilization can be covered by recycling P from food processing, manure, wastewater, and municipal solid waste
- Production technologies of BBFs should be adjusted accordingly to maximize the nutrient utilization and minimizing nutrient losses from BBFs in various growing conditions.

**Identified knowledge gaps**

| Fundamental gaps | Applied gaps |
|---|---|
| • Harmonisation of methodologies for assessing BBFs quality, safety and their environmental performance<br>• Need of consensual definitions and terminology | • Evaluating regional conditions (climatic, crop, soil) and BBFs characteristics for optimal use<br>• Evaluating BBFs at a field scale under different climatic and soil conditions |

**Key topics to be tackled in future working program**

- Local testing for optimising the use of BBFs in various growing conditions due to the heterogenous composition of BBFs
- Developing soil and BBF testing methods for optimizing the use of nutrients in crop production
- Establishing long-term field trials to validate the agronomic efficiency of various BBFs
- Harmonized methodologies for pollutants to ensure food and feed safety, and avoiding accumulation and losses to the environment after using BBFs

# ESNI COMMUNITY: MAIN OUTCOMES

## Current knowledge and identified knowledge gaps – Recommendations for future R&D activities

### Sustainability assessment for nutrient recycling

**Context at EU level**

Sustainability involves the understanding of the decision-making consequences in the environmental, economic and social dimensions. European societies aim to find the solution for guarantee the environmental protection of ecosystems and human health at the same time that allows the economic development social wellness. Science-based methodologies and decision-making tools such as Life Cycle Assessment or Social analysis are fundamental to enhance the decisions of stakeholders of the quadruple helix therefore, cornerstones of European advancement

**What has been learned?**

- There is a wide variability of products and technologies. BBFs should be assessed ono-by-one
- Differences in the methodological choices as main bottleneck for creating a solid knowledge
- Social aspects of BBFs are not fully studied
- BBFs products management interfere in C, N, P biochemical flows but they interact with agricultural practices, climatic conditions and other parameters.

**Identified knowledge gaps**

| Fundamental gaps | Applied gaps |
|---|---|
| • Lack of a consensus about methodological questions<br>• Knowledge gaps in the emissions behavior along the life-cycle of the fertilizer. | • Nutrient Use Efficiency is a valuable proxy to compare different nutrient efficiencies<br>• Prospective analysis of emerging technologies |

**Key topics to be tackled in future working program**

- Inclusion of social dimension in the assessment of BBFs value chain: development of conceptual frameworks and case studies
- Harmonization of methodological choices in the BBFs Life Cycle Assessment
- Development of biodiversity indicators and long-term evidences
- Ensure an efficient adoption of environmental monitoring systems along the value chain actors
- Compilation of robust Life Cycle data Inventories for databases creation
- Ensure that knowledge and results are useful for decision makers of the quadruple-helix stakeholders

### Policies and market uptake of recycled nutrients

**Context at EU level**

The European Commission has launched a Circular Economy Action plan. This has set the scope for the recovery of secondary materials and the recycling of nutrients. National targets are set on the implementation of schemes for source-separated municipal waste, urban waste water treatment and industrial emissions and landfill. This increased the supply of secondary resource materials and stimulated the development of innovative recycling technologies. In addition, the new EU Fertilising Product Regulation opened the internal EU market to organic and waste derived fertiliser products.

**What has been learned?**

- EU policies are a key factor driving the recovery of nutrients at local and national level
- Lack of transparency and differences in implementation and interpretation in national regulations are major roadblock for interregional market development.
- A change toward the perception of waste as a valuable resource of nutrients will stimulate the market acceptance and use of recovered nutrients.

**Identified knowledge gaps**

| Fundamental gaps | Applied gaps |
|---|---|
| • Targets and definitions in different pieces of EU legislation are not aligned, creating confusion and unintended barriers.<br>• Limited choice of recovered resource materials covered by Fertilising product regulation. | • End users are not fully engaged in development of technical and policy solutions, so recycled nutrient products may not meet demands.<br>• Data on efficacy and safety of recycled nutrients not always sufficient. |

**Key topics to be tackled in future working program**

- Development of quality standards and certification schemes to demonstrate the effective and safe use of recovered nutrients.
- Target ambiguous definitions and harmonisation of terminology in different pieces of EU legislation, and improve transparency on the transposition thereof in national law.
- Engage key stakeholders to facilitate the market uptake and use of recovered nutrients.
- Involve policy makers to develop policy solutions for legal barriers, and to set targets for efficient waste recovery to close the nutrient cycling.

# ESNI COMMUNITY: WHAT COMES NEXT?

- Series of webinars on monitoring and mitigating GHGs emissions, mainly in farms and in manure management (monitoring/measurement methodologies, BATs, innovative techniques…).
- Webinar on Biodiversity indicators
- Webinar on the terminology for circular fertilisers (bio-based, organic, reuse/recover/recycle,…)
- Implications of the revised EU- UWWTD (urban wastewater treatment directive)
- Webinar on first outcomes of the study on new CMC materials and processes under the FPR (fertilising product regulation)

# ESNI COMMUNITY: WHAT COMES NEXT?

Let us know what you would like!

QR CODE TO A SURVEY