

**Interreg**  
Baltic Sea Region



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Scaling Circular Nutrient Solutions: From Regional Innovation to European Best Practice

# Market development, bottlenecks & barriers

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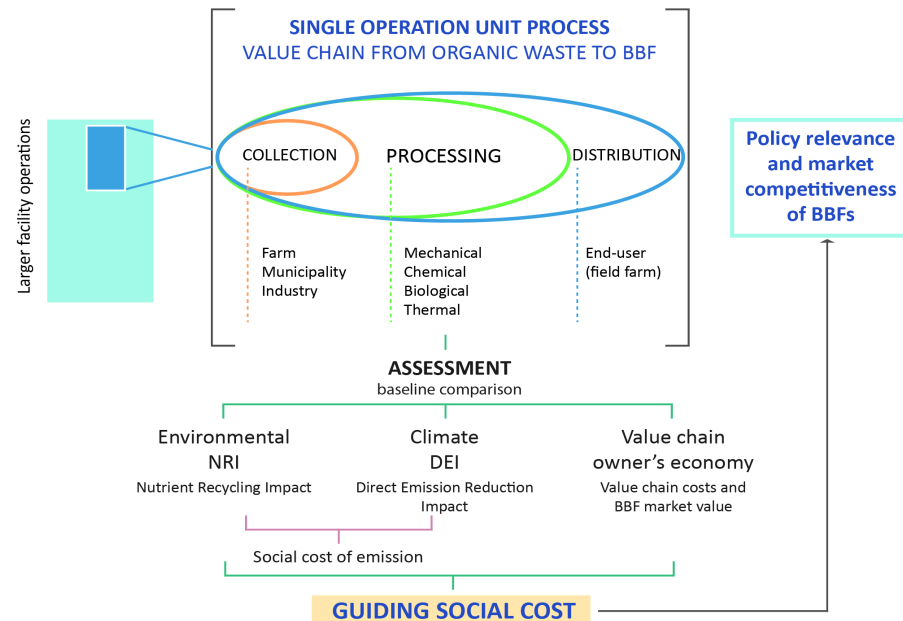
[interreg-baltic.eu/project/cinurgi](https://interreg-baltic.eu/project/cinurgi)



# The research

## Setting the scene

- To understand the market, we **analysed 11 value chains** (selected out of 24, identified via a call) for production of Bio-Based Fertilisers (BBFs) from organic wastes from farming, industry or municipalities. The value chain scope was confined to collection, processing and distribution. Evaluation happened in line with that after a Single Operation Unit Process (SOUP) methodology, having NRI, DEI and GSC as key indicators.



### Results:

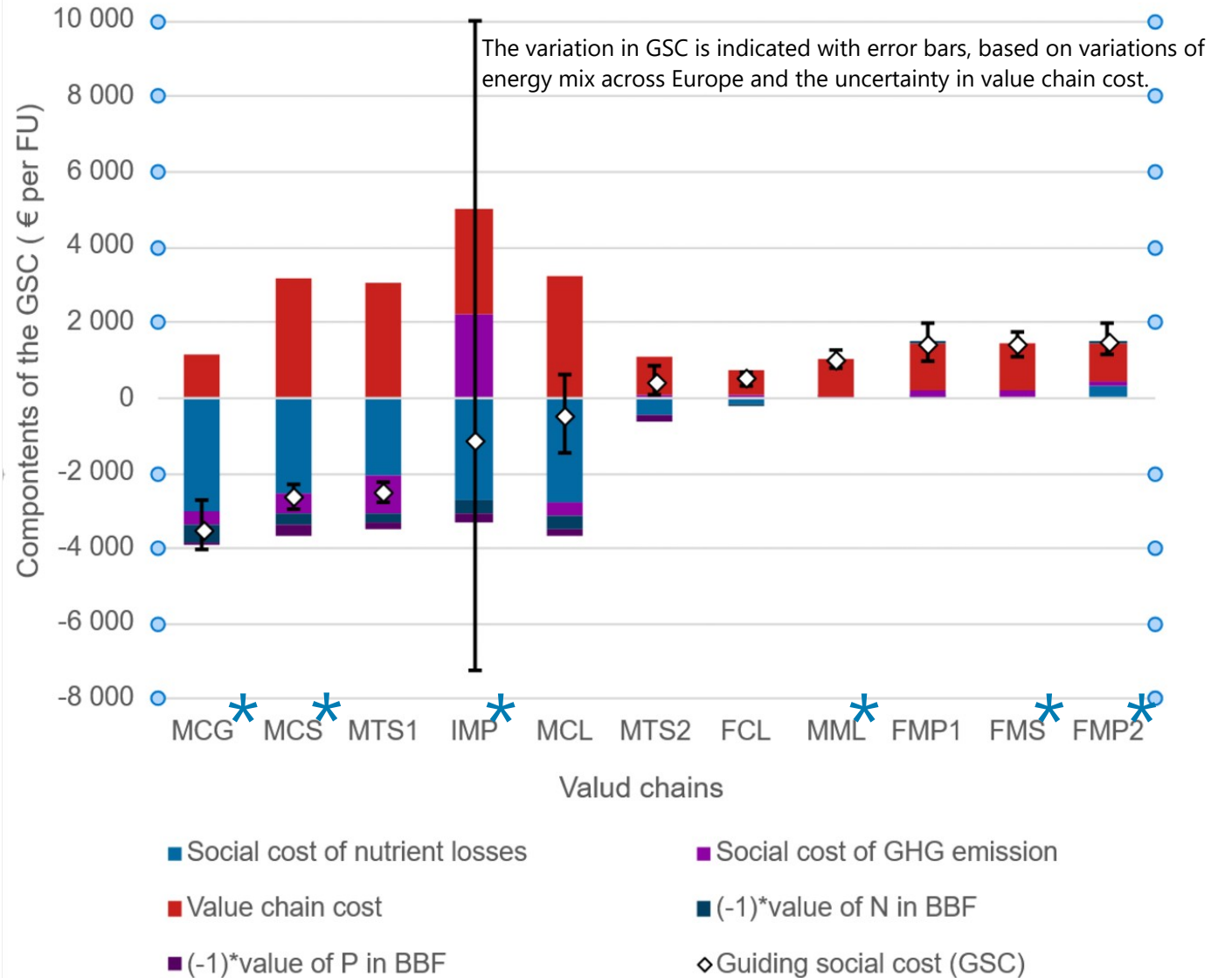
- Foged, H. L., Sylwan, I., & de Morais Lima, P. (2026).: *Identification and Assessment of Innovative Nutrient Recycling Solutions: Environmental, Climate, and Economic Performance. Technical Report.* <https://doi.org/10.5281/zenodo.18628679>
- Priscila D. Lima, Ida Sylwan, Oksana Valetska, Henning Foged (2026) *Bio-based fertiliser – custom-made method for evaluation of its production; environment, climate and overarching economic performance.* *Frontiers in Environmental Economics, section Resource Economics* 5:1805879. <https://doi.org/10.3389/frevc.2026.1805879>
- Foged, H. L., Sylwan, I., de Morais Lima, P., Virtanen, E., Laakso, J., Valetska, O., Sarvi, M., Brown Stummann, C., Virolainen Hynnä, A., & Witorożec-Piechnik, A. (2026).: *Market Evaluation and Review of Policy Affecting Nutrient Recycling.* <https://doi.org/10.5281/zenodo.18628997>

# Socio-economy

## Modest BBF value

Digging deep into the real cases has been an eye-opener; whereas others have concluded that farmers are unwilling to pay as much for BBFs as for mineral fertilisers (e.g. Moshkin et al., 2023), high production costs of BBFs (e.g. Hermann and Hermann, 2021)), and that environmental impacts vary between BBFs (e.g. Rashid et al., 2025), we found in addition

- a **modest socio-economic value of bio-based fertiliser production**;
- The **highest socio-economic benefits related with municipal organic wastes** (wastewater);
- A very marginal climate impact, whereas the socio-economic **most important factor is nutrient recycling / the avoidance of nutrient losses**
- **Moving nutrients (in specific P) in farm wastes via BBF production (mechanical separation is a key technology) is cheap** as also demonstrated by Arate et al. (2022)
- **Market competitiveness of BBFs almost non-existing**



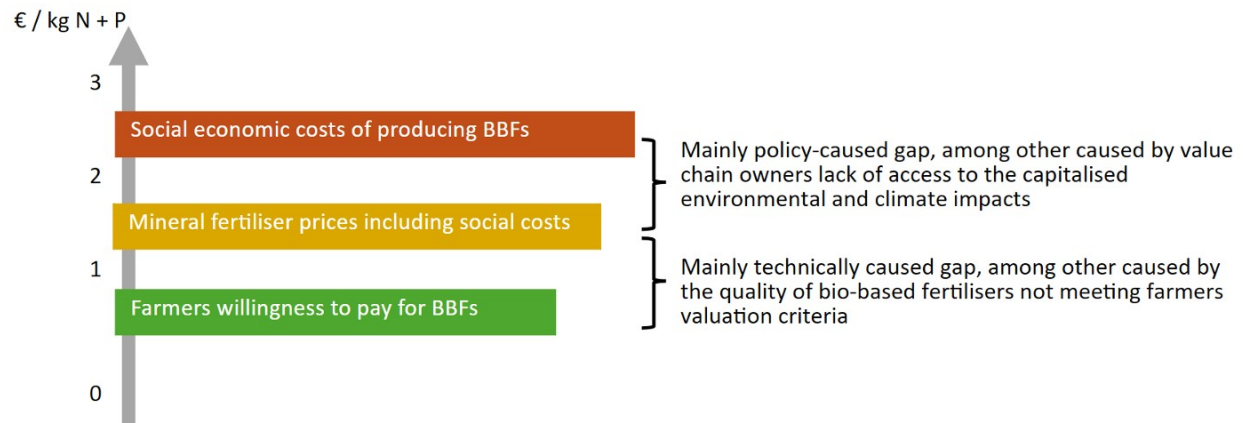
\* Overall winners of CiNURGI's Nutrient Recycling Award within their waste category, also considering market potential, farmer valuation and policy aspects.



# Farmers unwilling to pay for BBFs

## BBFs do not meet farmer valuation criteria

- It is **important that research develop better BBFs**, ie identify ways to convert nutrient rich organic wastes in a more efficient way, causing less process loss of nutrients and less process energy consumption, while matching crop farmers valuation of bio-based fertiliser much better than now.
- Among top-priorities for crop farmers are
  - Fertilising effect (readily available N and P nutrients (water soluble/extractable nutrients);
  - Nutrient concentration;
  - Ease of handling
  - Low risk
  - ...
- Remember the wise saying "The customer is always right"!



# Ecosystem services from BBFs

## It has a considerable value

- **Realising healthy BBF markets also require political will to revert societal values of ecosystems services to the BBF value chain operators** - the mechanisms are already part of the EU CAP.
- However, consequently, it seems logic that effective policies in the same time should penalise nutrient-rich organic waste processing that leads to pollution of the air and water with nitrogen, loss of phosphorus and conversion of organic matter to greenhouse gases. These processing methods, counterproductive to recycling goals are especially those based on thermal processing (incineration, pyrolysis), oxidative processing (nitrification-denitrification, composting, aeration), that generally are meant for getting rid of nutrients and making the waste "stable".
- Socio-economic impact elements of BBF production comprise
  - Value of Direct Emission Impact
  - Value of Nutrient Recycling Impact
  - Value of domestic fertiliser production
- We assessed the socio-economic value of BBF production as shown to the right - it is not easy for politicians to navigate in!
- **Reverting the socio-economic value of BBF production to the value-chain operations via subsidisation would increase the number of market competitive cases from two out of 11 to six out of 11.**

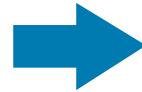
*Based on 11 analysed value chains for BBF production, the socio-economic value of impacts on climate emission, nutrient recycling and domestic fertiliser production was assessed per kg N + P as:*

- *Averagely €1.11*
- *Minimum € 0.09*
- *Maximum € 6.67*

# Terminological bottlenecks

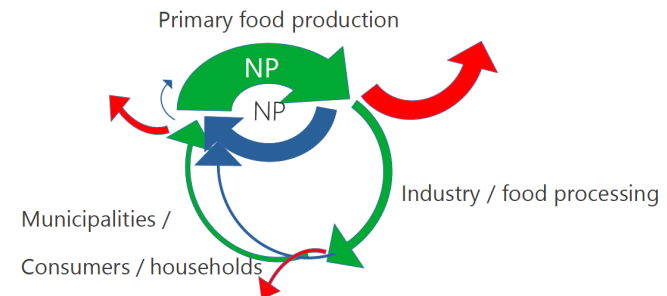
Nothing can be achieved before you agree what should be subject to change

**Nutrient-rich organic waste**  
**Bio-based fertiliser**  
**Soil improver**  
**Nutrient Recycling Fertiliser**  
**Nutrient-poor organic waste**



Would a revised definition of some waste types be relevant for removing unjust end-of-waste criteria bottlenecks?

- Our CiNURGi project showed that there is a great confusion about the meaning of these words.
- Effective research and policies cannot be made before clear definitions are established.
- A major misunderstanding is that EUs Fertilising Products Regulation (EU/2019/1009) shall be a reference for such definition – but its purpose is alone to regulate, what is brought to the market.
- Another major misunderstanding is that all products mentioned in the FRP are fertilisers – read the preamble.
- Even the meaning of recycling seems to cause problems





# Thanks

<https://interreg-baltic.eu/project/cinurgi/>

<https://zenodo.org/communities/cinurgi/records>

