Systematic recording and analysis of barriers hindering the widespread use of Bio-Based Fertilizers and Nutrient recovery from industrial and municipal wastewater

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Introduction

The AIM OF THIS WORK is to support the stable expansion of nutrient recovery (NR) from waste water (WW) and use of recovered nutrients as bio-based fertilisers (BBF).

The METHODOLOGY followed involved two steps:

i. first, an extended literature review of previous relevant surveys and a specialised web-based research on EU matrix sites (e.g. Fertilisers Europe (Fertilizers Europe, 2022), Registration, Evaluation, Authorisation and restrictions of Chemicals for fertilisers (REACH for fertilizers, 2022)) on the factors driving or hindering the use of NR options in WWT plants (WWTP) and

ii. second, a survey addressed to all the relevant stakeholders.

The TARGET GROUP is the:

entire value chain (problem owners, technology providers, intermediate users) who share information on the waste producers; the companies managing WW; the applied treatment methods; the technology providers, as well as the companies that are interested in buying the BBFs in order to sell them to the end users.

Nutrient Recovery awareness survey

There is a specific questionnaire for each role in the waste water and fertilizer fields (Fiqure 1).

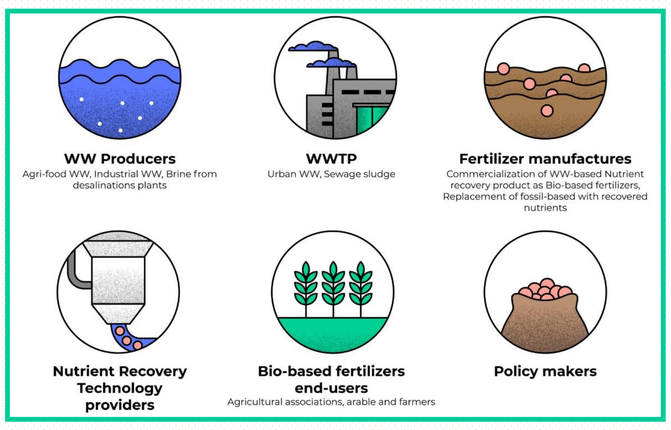

Figure 1: Nutrient recovery actors

Choose the role that suits you the best and give your contribution to close the waste water cycle!

Your opinion and your experience matter!

Agro industry specifications hampering BBFs' use

- Fear of contaminants.
- New machinery for the spread of not pellet-formed BBFs.
- Compensation by 40-60 % lower price than the traditional fertilisers.
- Farmers' budget:140-180 or 200-250 €/ha.
- Transportation (not pellet form), storage (odour) issues.
- No 'certification process', 'market permit' and/or 'standardization-spreading plan' (HU).
- Prohibition of STRUvite, Biochar and Incineration ash.
- "Fake tax" on mineral fertilisers means on BBFs too?
- Lack of legislation.
- Insufficient BBFs' quantity
- Stigma of WW-based products (Food industry reputation) (ES&FR).
- Crop yield variations.
- Lack of science-based knowledge on the evaluation of the BBFs performance effect on soil quality and crop yield.
- Coverage of the initial capital expenditure (CAPEX) of construction and equipment for BBFs' storage, handling and spreading.
- Prohibition of WW-based fertilisers in crop cultivation/organic farming. (Shared barrier by ES, FR, HU, IT).
- Animal-metabolism products utilisation (on land husbandries).
- Lack of integration of BBFs into existing solutions.
- Lack of follow-on support from consultants on innovative BBFs.
- 'If a BBF application dosage is small (due to condensation), it is perceived of low quality through the prism of its content in fertiliser components'.

Results & Discussion

Waste water value chain symbiosis

❑Early consideration in the planning phase of NR-oriented WWT processes is crucial to increase any chance of developing successful NR routes.

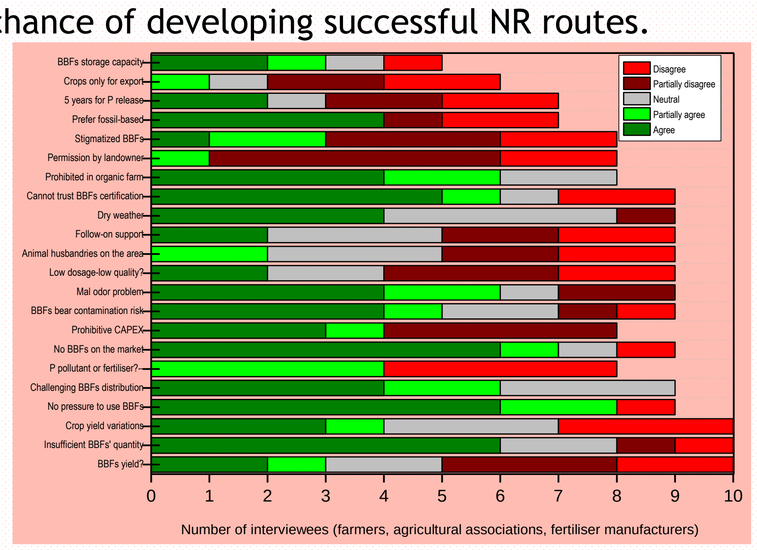

Figure 2: Allocation of lock-ins and barriers regarding the utilization of BBFs.

❑Implementing WW-based fertilisers successfully will require fertiliser manufacturers to extend their engineering expertise and to become market participants actively engaged with all aspects relevant to farmers (Figure 2).

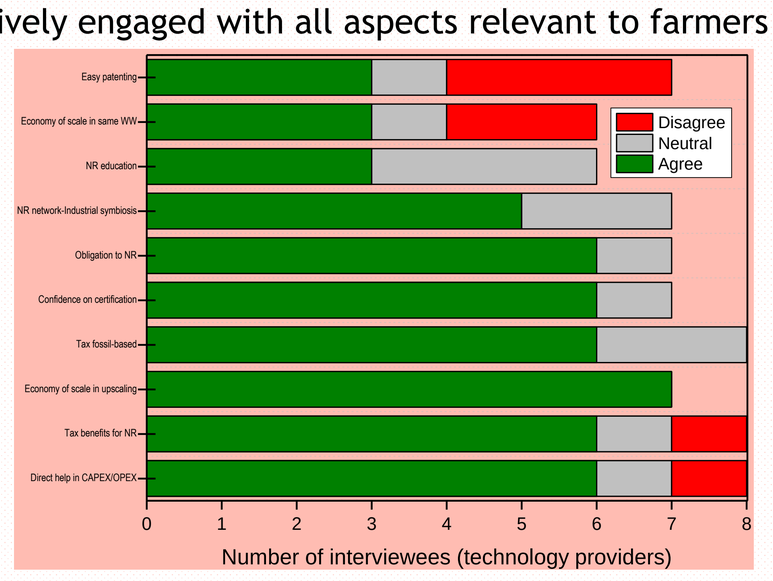

Figure 3: Measures to be implemented that would unlock the NR barriers.

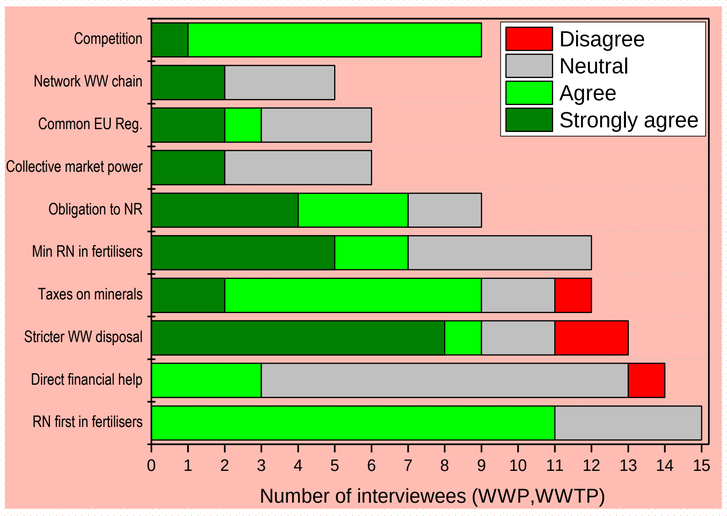

Figure 4: Factors that drive the deployment of NR options.

❑Technology providers will have to extend their engineering expertise and to become market participants actively engaged with all aspects relevant to the creation of value chains for recovered nutrients (Figure 3).

❑ Close cooperation of WWTP with technology providers is crucial since they both traditionally possess substantial expertise in process engineering and operations (Figure 4).

Conclusions

❑Policy makers avoided responding to the WalNUT survey. Due to the transitional state of the EU future, given that energy prices have raised by 700 %, fertiliser import has fully stopped.

❑ Joining forces to apply a common NR strategy across multiple WWTPs and thus exploit economies of scale – could well enhance economic competitiveness.

❑ Though it is more difficult to leverage positive change, all WalNUT stakeholders can develop strategies to convince policy makers or users about the necessity or harmlessness of BBFs.

❑ As farmers are saturate and unwilling to pay more, the goal is to manufacture complementing NPK turnkey goods.

❑ Even though the cost of recovered nutrients is significantly higher than the cost of fossil-based fertilizers and the current sale price of recovered products does not make the NR process economically viable, all changes related to life-cycle analysis, climate change, storage, carbon, and recycling should be taken into consideration.

With WalNUT, and thanks to your help, waste water is not wasted!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 101000752.