

Activities

The following activities were conducted:

- Laboratory analysis and testing for optimal prototype development
- Development and implementation of the prototype treatment system Struvite
- Monitoring of the efficiency of the prototype in reducing the nitrogen and phosphorus content in digestate/slurry
- Monitoring of emissions (ammonia, GHG and odor) from storage and spreading
- Evaluation of the economic and environmental sustainability of the innovation
- Dissemination of the results achieved and training courses

Further details

€ **Total budget:** € 185.819,96
Total financed: € 171.715,96
Main funding source: Rural development 2014-2020 for Operational Groups
Rural Development Programme: 2014IT06RDRP003 Italy - Rural Development Programme (Regional) - Emilia-Romagna

🕒 **Ended, 2021 - 2023**

📍 **Emilia-Romagna, Italy**

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Struvite

Livestock manure and digestates treatment to reduce emissions and produce Struvite

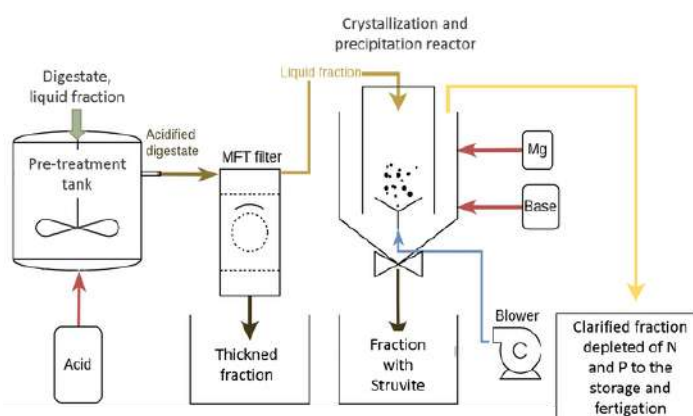


Objectives

The goal of the Struvite Operational Group was to decrease the nitrogen and phosphorus content in livestock effluent and digestates in order to reduce atmospheric emissions of ammonia, methane and nitrous oxide from both the storage and spreading phases compared to untreated manure or digestate. The nitrogen and phosphorus recovered produce a renewable, slow-release fertilizer (struvite) that can replace chemical fertilizers in nutrient-deficient areas.

To achieve this goal the OG designed and implemented a prototype, farm-scale system capable of producing and extracting Struvite.

Prototype for struvite recovery (above) and treatment line diagram (below)



Results

The recovery of phosphorus and nitrogen from agricultural digestate through the prototype Struvite system has proved technically feasible; the precipitate containing struvite must be further refined/evaluated, e.g. by a fertilizer manufacturer, in order to effectively replace phosphate minerals with phosphorus recovered from manure/digestate in accordance with the new European fertilizer regulation.

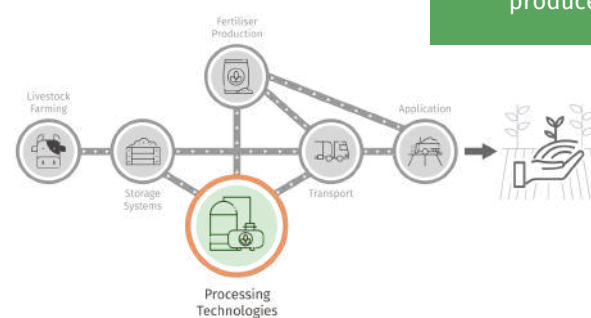
In tests with acidification, basification and microfiltration, the supernatant is depleted in nitrogen and phosphorus. For this reason the prototype treatment of digestate was effective in reducing emissions of ammonia and greenhouse gases, from the management of digestate. The reduced nitrogen content has allowed ammonia emissions to be reduced by 42% from storage and 19% from spreading, while the limited organic matter content resulted in a reduction of methane emissions from the storage phase by 86%.

The high concentration of solids and organic matter in the digestate, is still a critical issue; the prototype treatment system can and must be made more efficient.

Context

Animal manure is an excellent fertilizer matrix for crops and soils as it is rich in both macro and micro nutrients and organic matter, which are useful for the productivity of agricultural soils. The downside is the ammonia and greenhouse gases emission from slurry during storage and spreading. In fact, the Italian agricultural sector determines about 7% of national GHG emissions, and of this share 18.8% comes from manure management.

Location in the
Nutri-Know value chain



As for ammonia emissions, the agricultural sector accounts for 94% of national emissions with 49.9% of that share coming from manure management (ISPRA, Reports 318/2020 and 319/2020).

In Italy there are areas with a high presence of livestock farms where optimal management of animal effluents and digestates could result in reduced emissions. Not only that, a manure treatment also aimed at recovering the nutrients contained could promote the relocation of nitrogen and phosphorus surplus from high livestock areas to areas instead characterized by chemical fertilizer demand, in conjunction with the principles of Nutrient Recovery and Reuse and the Farm to Fork targets. The Farm to Fork strategy promotes a sustainable food system, the heart of the European Union's Green Deal, one of the main goals of which is to reduce industrial fertilizer use by 20% and nutrient loss by 50% by 2030.



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