

Activities

The following activities were conducted:

- Development of the prototype treatment system Struvite
- Monitoring the treatment efficiency in reducing the nitrogen and phosphorus content in treated digestate compared to input digestate
- Monitoring the ammonia, nitrous oxide and methane emissions from the storage and field application of the treated digestate fractions compared to the initial digestate. Ammonia emissions were evaluated by wind tunnel techniques while methane and nitrous oxide emissions by static chamber method
- OG dissemination, training courses, exchanges knowledge and field visits

Further details



Total budget: € 185.819,96

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Rural Development Programme: 2014IT06RDRP003 Italy - Rural Development Programme (Regional) - Emilia-Romagna



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Struvite

Emissions from storage and soil application are reduced recovering nutrients from digestate



Objectives

The goal of the Struvite Operational Group was to decrease the nitrogen and phosphorus content in pig digestate in order to reduce ammonia, methane and nitrous oxide emissions from storage, ammonia and nitrous oxide emissions from spreading. The nitrogen and phosphorus recovered produce struvite (a renewable, slow-release fertilizer product consisting of ammonium, phosphorus, and magnesium in a stable crystalline form) that can replace chemical fertilizers in nutrient-deficient areas and promote the nutrient balance in high livestock areas characterized by nutrient surplus.

On-site measurement of ammonia emissions after digestate soil application by Wind tunnel technique (above) and GHG emissions by static Chamber (below)



Results

The recovery of phosphorus and nitrogen from agro-livestock digestate thanks to Struvite crystallization and precipitation treatment has proved technically feasible.

Struvite OG designed a prototype system at farm-scale to recover nitrogen and phosphorus from digestate in a small volume of stable matrix, with a reduced nutrient and organic matter content in the remaining fraction.

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 of the treated output digestate 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 by 86%.

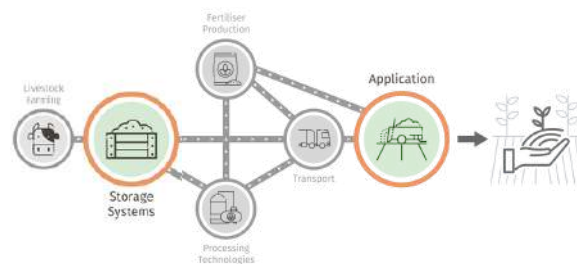
The circular management of pig digestate shifts the problem of climate-altering gas emissions from the digestate into a resource.

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 agricultural soils. The downside is the ammonia and greenhouse gases emission from slurry or digestate during storage and spreading. In fact, the Italian agricultural sector determines about 7% of national GHG emissions, and of this share 19% comes from manure management.

Location in the
Nutri-Know value chain

Emissions from storage and soil application are reduced recovering nutrients from digestate



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).

Digestate from biogas plants must be stored and applied to crops when there is a need for its excellent content of plant nutrients. However, the downside is the high emissions potential from the liquid digestate during the storage phase. Ammonia emissions are high because there is a significant amount of nitrogen in ammonia form in the digestate and greenhouse gases (methane) are emitted due to the high organic matter content, even if it is less than in not digested slurry.

In Po Valley there is a high presence of livestock farms with biogas plant and so an optimal management of manure and digestates could result in reduced emissions.



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