

Activities

- Implementation of the air washing system to a TRL level 8
- Monitoring and evaluation of the air treatment efficiency and cost-benefit in a real pig livestock
- Ammonium sulphate production and chemical characterization
- Quantification of GHG reduction (kg CO₂eq/kg pig meat) due to replacement of industrial fertilizers
- A transferability case study
- Dissemination of the activity of the OG and results achieved
- Training courses, exchanges and field visits

Further details



Total budget: € 189.757,14

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Gas Loop

Ammonia emissions in pig livestock from a problem to a fertilizer resource



Objectives

The objective of this OG is to generate a nitrogen virtuous cycle (loop) in the pig farming, which, producing ammonium sulphate by capturing ammonia emissions, reduces chemical inputs for the farming crops and consequently GHG emissions generated by their industrial production.

The aim is also to increase the animal welfare and productivity due to better air quality inside the pig housing (PDO heavy pig supply chain).

Operating pilot plant to clean and recover ammonia from pig rooms air



Results

Gas Loop device draws ammonia-rich air from the pig housing and the air treatment is based on the chemical absorption of ammonia by counter current washing with an acid reagent sprayed into a tower scrubbing. Sulfuric acid solution reacts with ammonia to form a stable solution of ammonium sulphate.

An important result was achieved, in addition to reducing ammonia emissions, the production of an ammonium sulphate solution (230 liters t live weight⁻¹ yr⁻¹) characterized by a pH 4, a Total Nitrogen content of 6,4% (99% as NH₄⁺-N) and Total Organic Carbon of 1% in weight. Ammonium sulphate solution produced complies with the UE Regulation 2019/1009 as liquid inorganic N fertilizers.

The recovered fertilizers allows a GHG reduction due to replacement of N industrial fertilizers equal to 66 kg CO₂eq per year and per t of live weight. OG has shown that it is possible to recover 14.5 kg N per t of live weight per year.

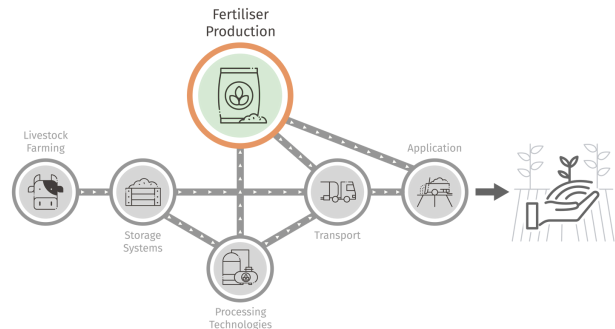
The treatment costs 0.16 €/kg of live weight sold, which destined for heavy pigs for the PDO Parma ham supply chain, has an impact of 7.3% on the sales value (already net of the sale of fertilizer).

Context

The average ammonia emissions to air from the intensive housing for fattening pigs, when no mitigation measures are applied, is in the range 1.8 ÷ 4.9 kg NH₃ ap⁻¹yr⁻¹ (IRPP Bref, 2017).

Location in the
Nutri-Know value chain

Ammonia
emissions in pig
livestock from a
problem to a
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Efficient and affordable solutions to reduce the ammonia emissions and, at the same time, increase the nutrient recovery, improve animal welfare and the health of workers, have to become more and more necessary in the BATs, to improve sustainability of the farming systems in the frame of the circular economy. This is particularly true in areas with high industrial and livestock intensity such as the Po Valley (where Emilia-Romagna region is located) where ammonia emissions cause problems for air quality and where ammonia is a precursor to the formation of fine particulate matter (PM 2,5 – PM 10).

The EIP-AGRI Operational Group Gas Loop has implemented (up to a Technological Maturity Level equal to TRL 8) and monitored (1 year) an air washing system that removes ammonia from the pig stables, recovering it in an ammonium sulphate solution.

An important nutrient such as nitrogen, which in the form of ammonia emitted into the atmosphere causes so many problems, can be recovered and give life to fertilizers in a view to nutrient recovery and reuse.



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