

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
- Monitoring of indoor air quality in the treated pig house compared to an identical untreated pig house (NH₃, N₂O, CH₄, H₂O, CO₂, Odour, Temperature, Umidity)
- Evaluation of the animal feed conversion index and the state of the pig's lungs health at the slaughterhouse
- 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

Total financed € 176.081,45

Main funding source: Rural development 2014-2020 for Operational Groups

Rural Development Programme:

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



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Emilia-Romagna, Italy



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Gas Loop

Ammonia emissions capture for a virtuous nitrogen cycle in pig livestock

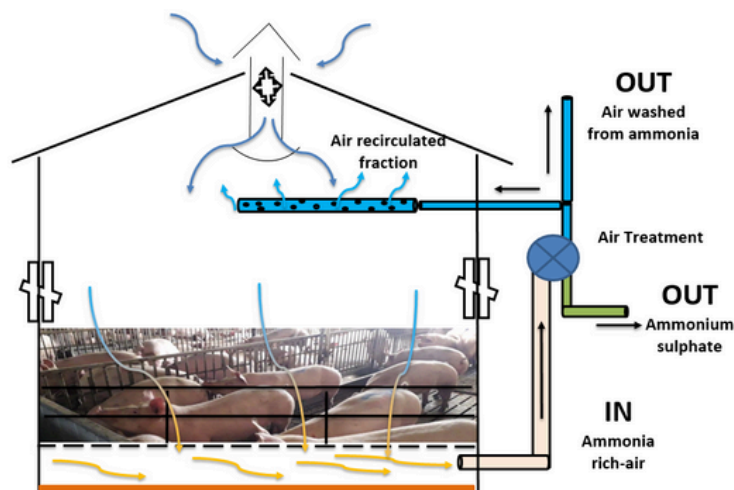


Objectives

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).

Pig livestock Ammonia Washing Machine treatment layout



Results

Gas Loop has implemented up to a Technological Maturity Level equal to TRL 8 the ammonia air treatment. The device draws ammonia-rich air from the pig housing through suction ducts located below the slatted floor and wash it.

The 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 is used which reacts with ammonia to form a stable solution of ammonium sulphate, then collected in a tank. The treatment does not replace the existing ventilation but complements it with a flow rate of 14 m³/h per pig. The air treatment improves the indoor air quality, reducing the average ammonia concentration inside the treated room by 62% (range 57-67%) compared to the control room. It was possible to avoid ammonia emissions into the atmosphere for 1.94 kg NH₃ ap⁻¹yr⁻¹. The greatest benefits were found in the winter time.

The ammonia reduction in the pigsties improves animal welfare, the pig's lungs health and the health of workers.

The best breeding conditions increase the feed conversion rate and nitrogen use efficiency.

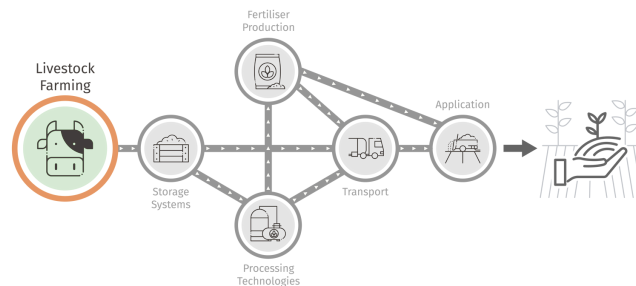
The treatment costs 0.16 €/kg of live weight sold, which destined for heavy pigs for the PDO Parma ham supply chain, has an impact of 7.3% on the sales value.

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 capture
for a virtuous
nitrogen cycle in
pig livestock



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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