Economic impact assessment of the BATs implementation in typical pig farms. Normative fit in the projection of ammonia emission inventories associated with the pig sector

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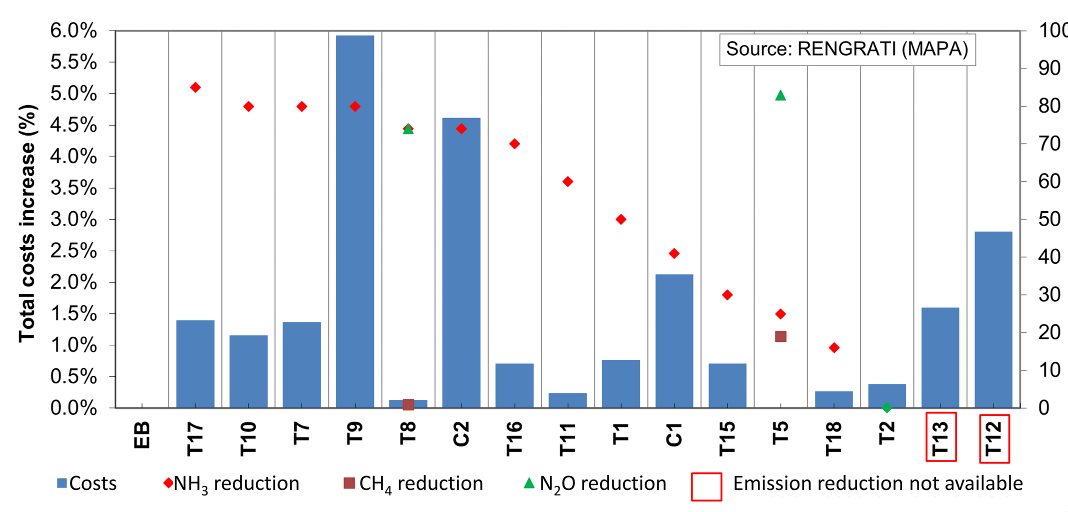
Research Question/s

In the Spanish pig sector, one of the main constrains of production in the medium term is ammonia emission reduction, because it is conditioning the growth capacity of the sector. Therefore, a legislative actions evaluation in order to set up emission reduction levels is needed.

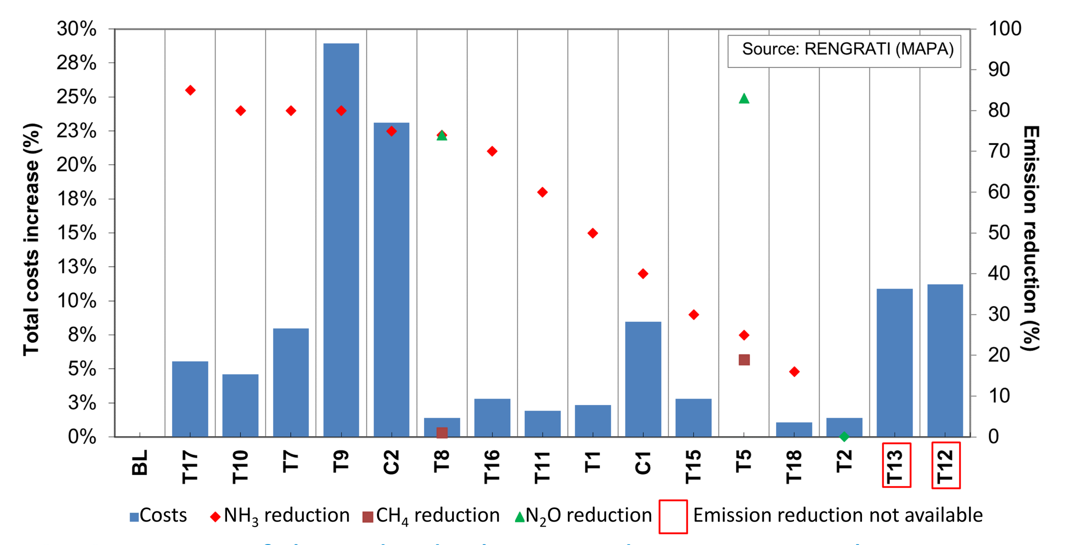
Best Available Techniques (BATs) implementation is one of the major options for reducing emissions at farm level. For this reason, in order to analyze the impact of the legislative actions, BATs effectiveness and its economic impact must be evaluated. The present study evaluates two key questions related to the implementation of BATs for ammonia reduction:

- **Total cost impact:** Total costs (cash costs, depreciation and opportunity costs) analysis of the sow and finishing enterprises taking into account different BATs implementation scenarios (application of each individual technique and combined scenarios).
- **Profitability impact:** variation of the farm income of the sow enterprise (€ per 100 kg of live weight of piglet produced) and farm income of the finishing enterprise (€ per 100 kg of live weight) taking into account different BATs implementation scenarios (application of each individual technique and combined scenarios) respect to the baseline.

Results and Conclusions



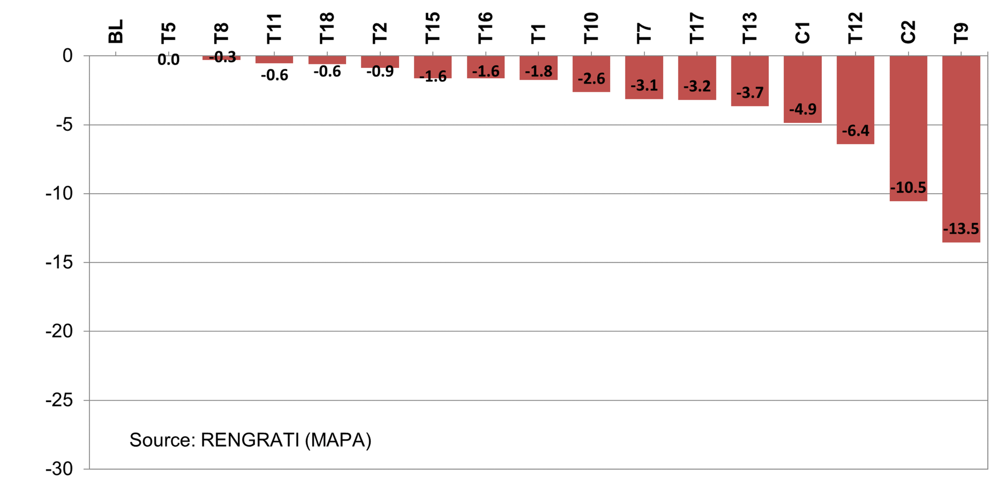
GR 1: Impact of the individual BATs and scenarios implementation on total costs and emission reduction estimation (sow enterprise)



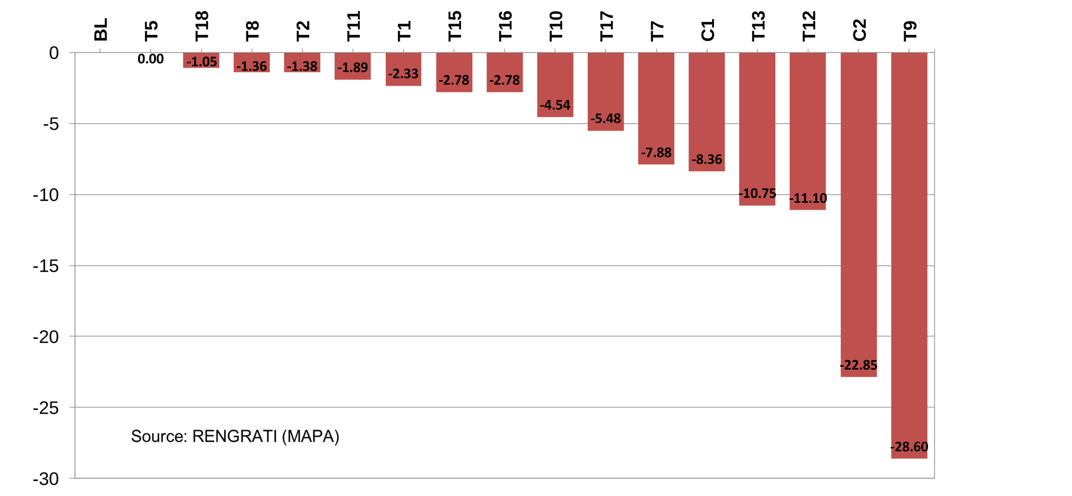
GR 3: Impact of the individual BATs and scenarios implementation on total costs and emission reduction estimation (finishing enterprise)

Finishing enterprise

Sow enterprise



GR 2: Ranking of Impact of the individual BATs and scenarios implementation on farm income (sow enterprise)



GR 4: Ranking of Impact of the individual BATs and scenarios implementation on farm income (finishing enterprise)

Conclusions on the results

- Individual technique T9 (rigid cover with anaerobic digestion of slurry) and the combination of C2 techniques have high potential effect on the reduction of emissions, but they have high influence on profitability, so mandatory adoption is not recommended.
- As alternative options, the use of the individual technique T10 (flexible covers) and the combination of techniques C1 are associated with similar emission reductions but significantly lower cost, so less influence on profitability.
- Depending on the structural situation of the farm, there are many other BAT alternatives that provide large emission reductions.

Conclusions and effects on regulation implementation

- In order to meet emission reduction targets, establishment of individual emission reduction targets (allowing flexibility in the selection of BATs) rather than the mandatory use of specific techniques is more appropriate.
- On existing farms, establishing the cover of the slurry store by means of a rigid cover is not recommended due to its very high economic impact.
- In the medium term, the economic effect of setting mandatory BATs is compatible with the competitiveness of pig producers.

Data and Methods

BATs selected and combined scenarios

BREF-BAT		TECHNIQUE		REDUCTION (↓%)		
		Nº	DESCRIPTION	NH_3	CH_4	N_2O
16	Slurry acidification	T1	Slurry acidification	-50%	n.a.	n.a.
19	Mechanical separation of slurry	T2	Screw press separator	0%	n.a.	n.a.
30	Reducing the emitting surface area/volume + frequent slurry removal	T5	System for frequent slurry removal	-25%	-19%	-83%
	Wet acid scrubber	T7	Air cleaning system with H_2SO_4	-80%	n.a.	n.a.
	Bioscrubber	T8	Biotrickling filter	-74%	-1%	+74%
16	Cover the slurry store	T9	Rigid cover with Anaerobic digestion of slurry	-80%	n.a.	n.a.
		T10	Flexible covers	-80%	n.a.	n.a.
		T11	Air-inflated floating cover	-60%	n.a.	n.a.
19	Aerobic digestion of slurry	T12	Aerobic digestion of slurry	n.a.	n.a.	n.a.
	Nitrification-denitrification of slurry	T13	Nitrification-denitrification	n.a.	n.a.	n.a.
21	Slurry landspreading	T15	Slurry dilution and band spreader by trailing hose	-30%	n.a.	n.a.
		T16	Shallow injector (open slot)	-70%	n.a.	n.a.
		T17	Deep injector (closed slot)	-85%	n.a.	n.a.
n.a.		T18	Buried underground slurry process (< 24 h)*	-16%	n.a.	n.a.

*Technique not included as BAT in BREF, but tested with success

Combination of techniques	TECHNIQUE		Accumulated reduction NH_3	
	Nº	DESCRIPTION	Sows	Finishing
C1	T5	System for frequent slurry removal	-41%	-40%
	T10	Flexible covers		
	T15	Slurry dilution and band spreader by trailing hose		
	T18	Buried underground slurry process (< 24 h)*		
C2	T2	Screw press separator	-74%	-75%
	T7	Air cleaning system with H_2SO_4		
	T11	Air-inflated floating cover		
	T17	Deep injector (closed slot)		
	T20	Cover solid manure heaps*		
	T25	Immediate incorporation of solid manure by ploughing into the soil (< 4 h)*		

* Generally applicable for slurry solid fraction after mechanical separation (technique nº 2)

Typical farms selected

Data from two typical farms of RENGRATI (National Network of Typical farms) and *agri benchmark* network (ES_2500_0 and ES_0_3900) for the year 2016, have been used according to *agri benchmark* methodologyes and procedures.

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