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**Best Available Techniques assessment
under Spanish conditions**





Best Available Techniques assessment under Spanish conditions

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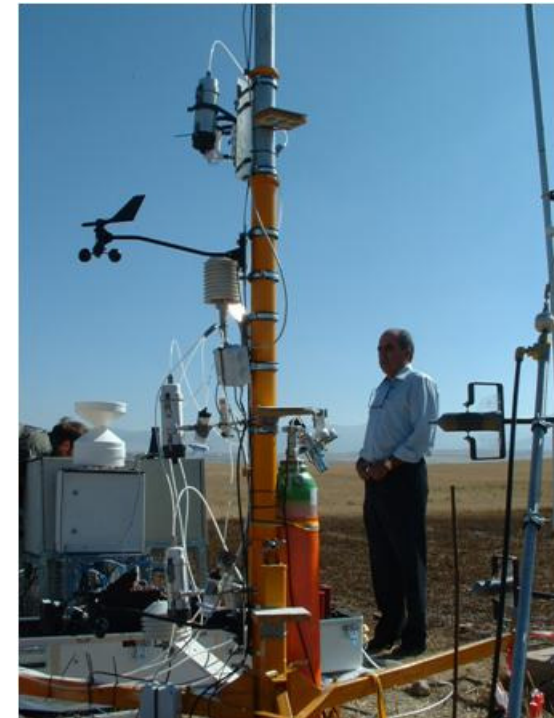
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Introduction

- ✓ Integrated Pollution Prevention and Control Directive (IPPC) is aimed to decrease emissions and to save resources (water and energy) through the promotion of the Best Available Techniques (BAT).
- ✓ Spanish Ministry of the Environment and Rural and Marine Affairs, implemented a plan to evaluate the BAT proposed under Spanish management systems and climatic conditions.



Material and Methods

- ✓ The candidate BAT were selected from the Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs (BREF, 2003) based on:
 - their potential efficiency
 - applicability
 - cost-effectiveness
 - and eligibility under Spanish conditions
- ✓ The BAT selected were assessed for the pig and poultry sectors under commercial conditions in the different production phases.

Material and Methods

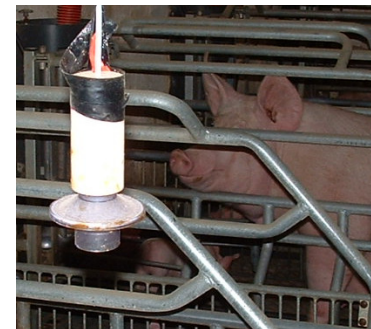
✓ All of the techniques were assessed under commercial conditions in every production phase.

- Poultry
 - Laying hens
 - Broilers
- Pigs
 - Gestating sows
 - Lactating sows
 - Nursery
 - Growers-finishers



Material and Methods

- ✓ Gas concentration measured by a photo acoustic infrared spectroscopy gas analyzer.
- ✓ Air extraction speed and temperature were controlled.
- ✓ Length measurement period (productive period).



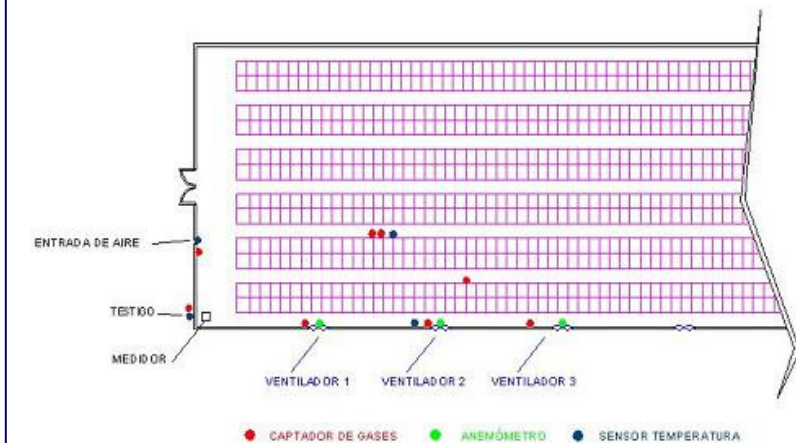
Poultry. Laying hens



Comercial farm El Espinar del Henares (Guadalajara)



Measurement system: Innova 1312 (Sir S.A., Madrid)



Gas and temperature sensors, anemometers

Poultry. Broiler

Comercial farm: Pinarejos (Segovia)

– Efects:



	Reference system	Best Available Techniques
Drinking systems	Traditional drinking systems	Non-leaking drinking systems

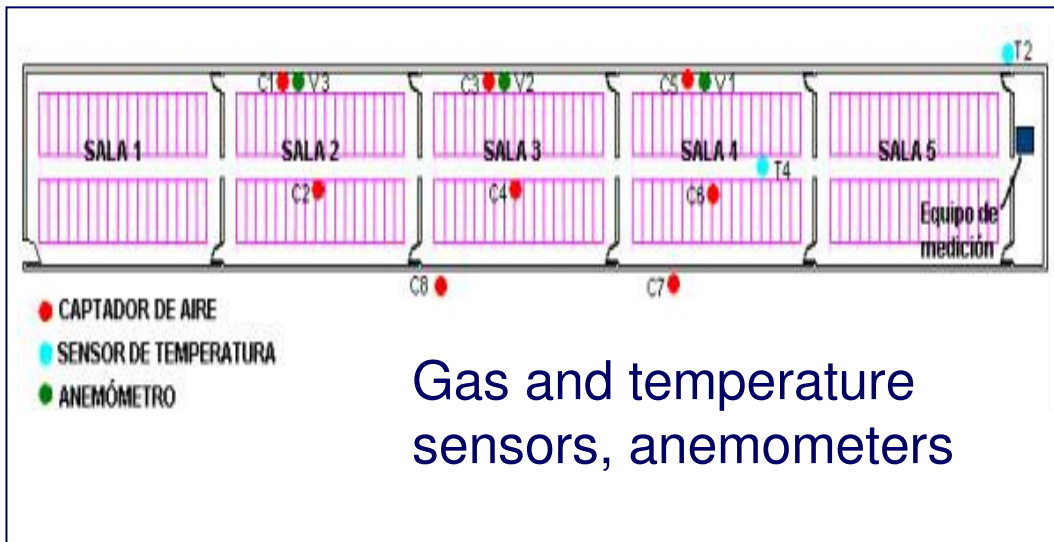
- Controls: NH_3 , CH_4 , and N_2O .
- Innova 1312 (infrared photo acoustic)
- Extraction velocity and temperature



Gestating sows



Comercial farm in Turégano (Segovia)

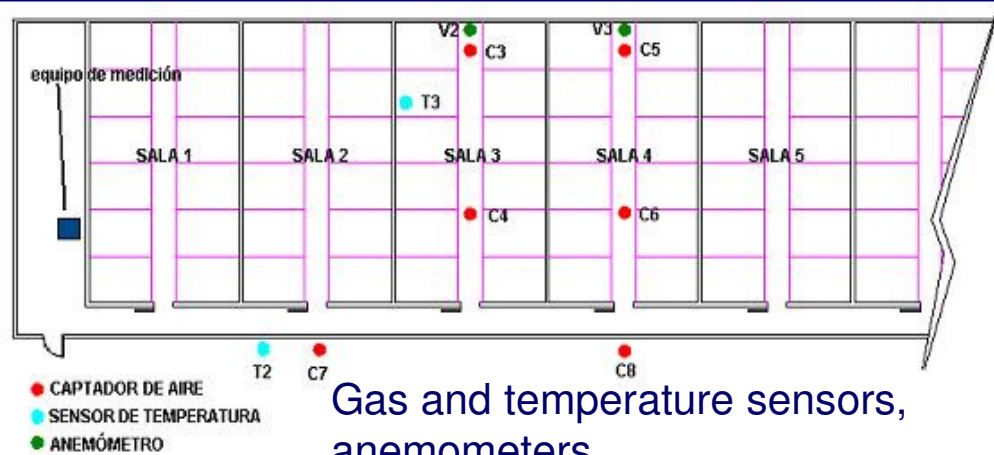


Measurement system: Innova 1312 (Sir S.A., Madrid)

Lactating sows



Comercial farm in Turégano (Segovia)



Gas and temperature sensors, anemometers

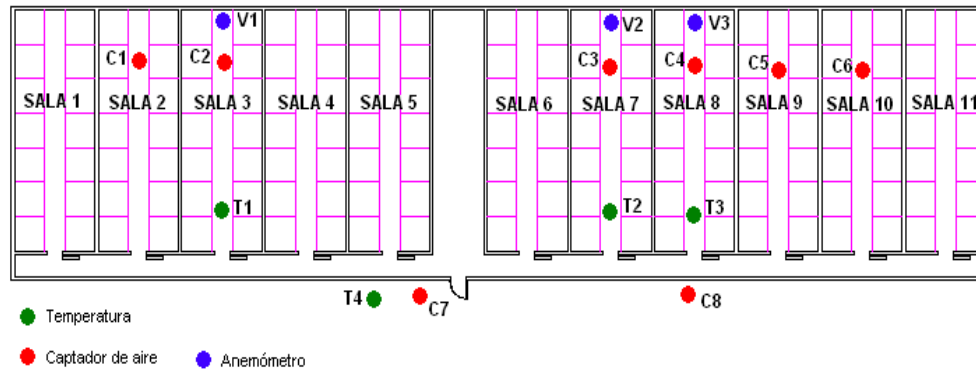


Measurement system: Innova 1312 (Sir S.A., Madrid)

Nursery



Comercial farm
in Cantalejo
(Segovia)



Gas and temperature sensors, anemometers

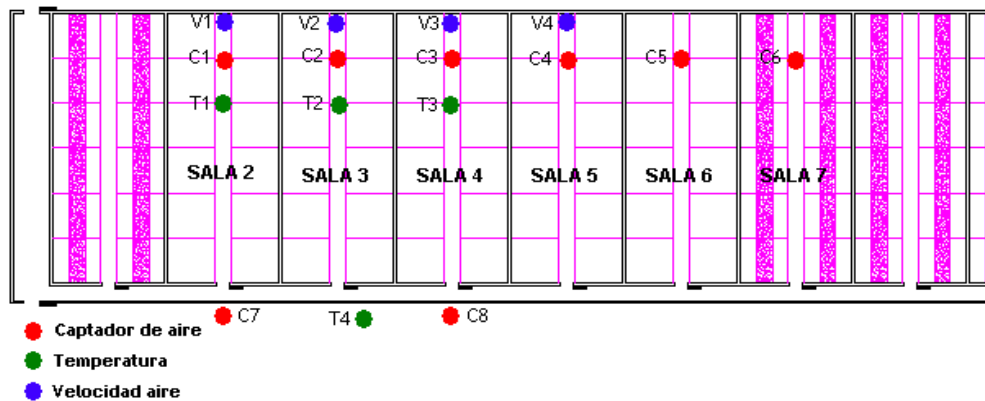


Measurement
system: Innova
1312 (Sir S.A.,
Madrid)

Growers-finishers



Comercial farm in Cantalejo (Segovia)



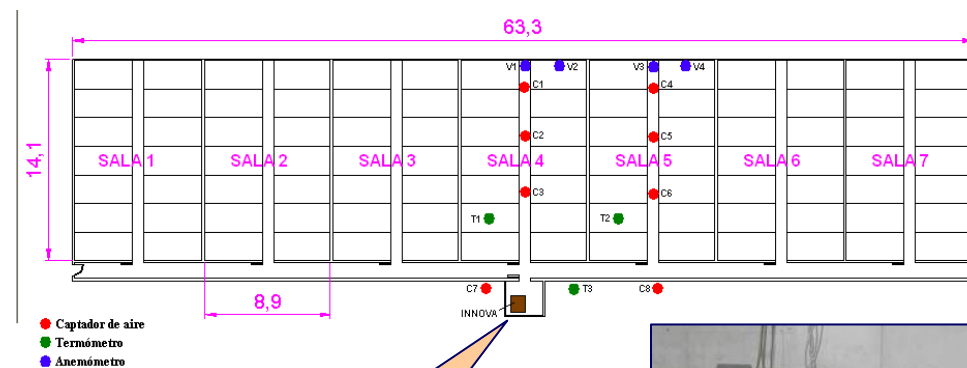
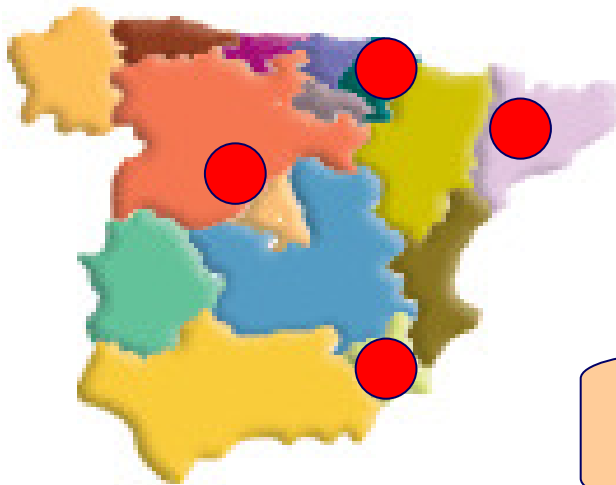
Gas and temperature sensors, anemometers



Measurement system: Innova 1312 (Sir S.A., Madrid)

Measurement in different climactic areas

- ✓ Emission measurement (ammonia, methane and nitrous oxide inside farms).
- ✓ Trials in Castilla y León (2005), Cataluña (2006), Murcia (2008) and Navarra (2009).



Gas and temperature sensors, anemometers



- ✓ With the results, emission factors can be validated as reference of Spanish farms.

Results. Nutritional techniques

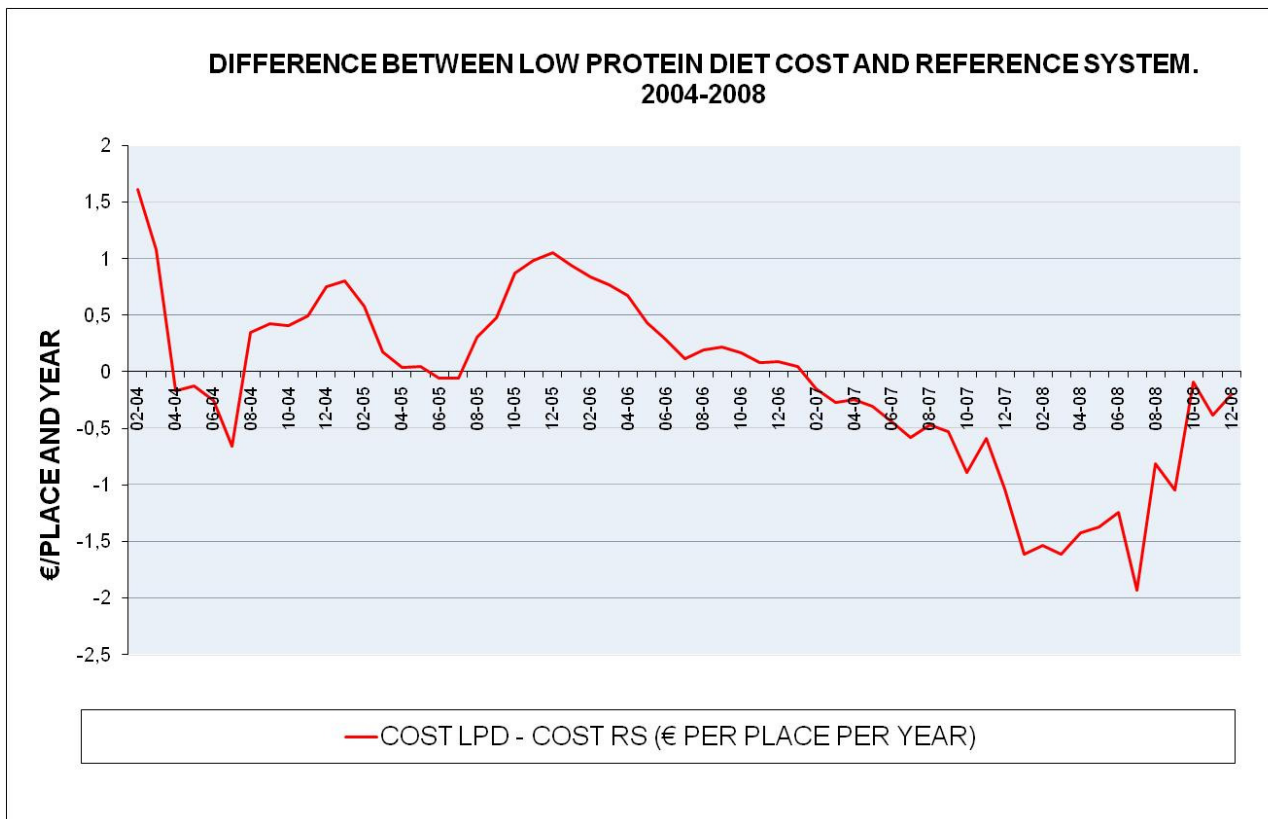
Results

Reference system: one feed	Slurry N reduction(%)	Ammonia emission reduction(%)	Extra cost (€ per place per year)	Extra cost (€ per t pig produced)
Phase feeding. Growers – finishers pigs	↓ (10)*	↓(10 – 15)*	0.70 - 1.02	2.4 - 4.0
Phase feeding. Gestating and lactating sows	↓ (7)*	-	0	0

()*BREF data

Results. Nutritional techniques

Reference system: Traditional protein formulation	Ammonia emission reduction(%)	Extra cost (€ per place per year)	Extra cost (€ per t pig produced)
Low protein diet with synthetics amino acids. Growers-finishers pigs.	↓30 - 40	-1.03 - 1.93	-3.51 - 6.34



Results. Gestating sows

Results

Reference system: total slat and minimum slurry removal		Emission variation (%)				Extra cost (€ per place per year)	Extra cost (€ per t pig produced)
		NH ₃	N ₂ O	CH ₄	CO ₂		
Partial slat and reduced manure pit	Existing building	↓(20)* - 50	↓68	↓28	-	5.69 - 6.83	2.1 - 3.0
	New building					0	0
Littered systems (straw based) using good practices (enough straw, changing the straw frequently, functional areas)	Existing building	↓14	↑178	↓66	↓27	72.71 - 80.45	27.3 - 30.2 **
	New building					47.61 - 55.35	17.9 - 20.8 **
Frequent manure removal		↓(25)*	↓83	↓19	-	0	0

()*BREF data

Results. Lactating sows

Results

Reference system: total slat with rectangular section.		Emission variation (%)				Extra cost (€ per place per year)	Extra cost (€ per t pig produced)
		NH ₃	N ₂ O	CH ₄	CO ₂		
Combination of a water and manure channel	Existing building	↓(52)*	-	-	-	16.74 - 20.09	2.1 - 2.5
	New building					3.29 - 3.95	0.4 - 0.5
Manure pan underneath	Existing building	↓32-(65)*	↓43	↓65	↓43	30.98 - 37.18	3.9 - 4.6
	New building					17.52 - 21.02	2.2 - 2.6

()*BREF data

Results. Nursery

Results

Reference system: Total slat, deep pit with rectangular section and removal manure at the end-cycle		Emission variation (%)				Extra cost (€ per place per year)	Extra cost (€ per t pig produced)
		NH ₃	N ₂ O	CH ₄	CO ₂		
Manure channel with sloped side walls	Existing building	↓(30)*-60	↓27	↓65	↓50	1.27 - 2.67	1.5 - 3.1
	New building					0 - 0.23	0 - 0.3
Partial slat and reduced manure pit	Existing building	↓(25-35)*	-	-	-	0.88 - 2.25	1.0 - 3.9
	New building					0	0
Frequent manure removal		↓25	↓41	↓10	↓27	0	0

()*BREF data

Results. Growers-finishers

Results

Reference system: Total slat, deep pit with rectangular section and minimum removal manure		Emission variation (%)				Extra cost (€ per place per year)	Extra cost (€ per t pig produced)
		NH ₃	N ₂ O	CH ₄	CO ₂		
Partial slat and reduced manure pit	Existing building	↓30-35	-	↓30-38	↓37-41	3.61 - 4.33	12.3 - 14.7
	New building					0	0
Manure channel with sloped side walls	Existing building	↓10-30	-	↓51-52	↓6-8	6.45 - 7.74	21.9 - 26.3
	New building					0 - 0.73	0 - 2.5
Littered systems (straw based) using good practices	Existing building	↓(20-30)*	-	-	-	36.51 - 42.07	124.2 - 143.1 **
	New building					20,16 - 25,72	68.6 - 87.5 **
Frequent manure removal		↓30-60	-	↓30-65	↓30-60	0	0

()*BREF data

Conclusion

- ✓ The information provided is being used by farmers and technicians in order to understand better the effect of BAT and to promote their use in the production sector.
- ✓ This information has been incorporated to:
 - The software to calculate pollutant emissions developed for the Spanish Ministry
 - The BREF, 2003 revision

Thank You

