Ammonia emission after application of pig slurry in Spain

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Introduction

In Europe, NH_3 emission to air from agriculture is at the same level as the emission of nitrogen oxides from traffic and stationary combustion plants together.

NH_3 emissions:
• Contribute to the acidification of soils
• Contribute to the eutrophication of terrestrial ecosystems and surface waters.
• Constitute a large fraction of the fine particles that can affect human health and the radiation balance.

Continuous **control of NH_3 emissions** will make a positive impact on the air quality.

Modern agriculture is **the largest source of nitrogen** releasing to other ecosystems.

The **land spreading of animal manure** represents approximately one-third of the total NH_3 emissions from agriculture.

Objective

The aim of this study, financed and coordinated by the Spanish Ministry of the Environment and Rural and Marine Affaris, was **to evaluate the efficiency for reducing NH_3 loss of different pig slurry application techniques** at field-scale on grassland and arable soils in the Central Plateau of Spain (Segovia).

Material and Methods

Method:

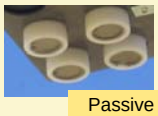
- Several experiments at field scale were performed during 2004-08 in Segovia (Spain)
- Control treatment: application of similar nitrogen load through mineral fertilizer
- The same load of total nitrogen was applied in all treatments:
  - 1. Broadcast spreader with a splash plate
  - 2. Band spreader
  - 3. Trailling shoe spreader

1. Broadcast spreader with a splash plate

2. Band spreader

3.Trailing shoe spreader

Meteorological tower



Passive samplers (Ferm type)

Experimental design:

- Meteorological tower was installed to optimize the experimental setup and select a correct plot orientation.
- Ammonia concentration fields around and gradients above ground in the application plots were measured with passive samplers (Ferm type), that were collected at different times.

Location:

- The central plateau of Spain (Segovia). Experimental lands

Grassland

Arable soils

Sampling and controls:

- **Meteorological variables**: wind speed, direction, temperature and radiation
- **N-NH_3** concentration of the slurry
- **NH_3** concentrations in the atmosphere according to the following procedure:

Sampling distances	Sampling heights (m)	Time Collected (h)	Background distance (m)
Up to 200 m	From 1.8 to 3 m	5 to 120 h (depending on the experiment)	1300

Results and Discussion

- Ammonia emissions for the mineral fertilizer application were near 0 µg/m²s.
- The broadcast spreading with splash plates resulted in the highest emissions.
- Percentage of reduction observed respect to splahs plate was:
  - 25-58% for band spreader,
  - 49% for trailing shoe spreader
  - 38% for injection
- The slurry application systems evaluated were **effective** in the reduction of NH_3 loss from grassland and arable soils.
- The results from different application techniques differences were of the order of 10%, although the variability was high for different experiments probably due to the different meteorological conditions.

Percentage of reduction observed respect to splash plate for all experiments.

	Grassland	Arable after harvest	Arable implanted cereal
Splash plate	0	0	0
Splash plate buried		16 – 42	
Band spreader	58	25 – 39	26
Trailing shoe spreader	49		
Injection		38	
Mineral fertilizer	100	(41) 94 - 100	80
Mineral fertilizer buried		100	

White cells = no experiment done
Green = 2 experiments
Shaded cells indicate practice not possible.
Light green = 1 experiment
Dark green = 3 o more experiments

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