(1)

(2)

Literature review on NH_3 and GHG emitted by pig production

Part 2: storage, treatment and spreading

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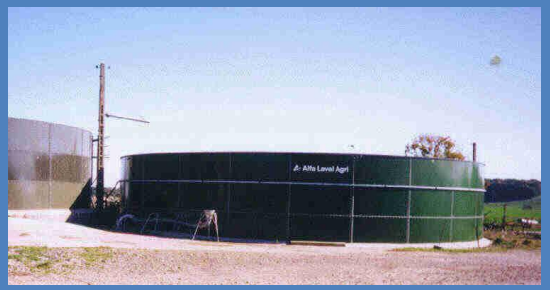
Session 47: Livestock farming systems free communications

Part 2 – storage, treatment and spreading

Building



Storage

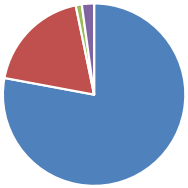
Spreading and treatment

Building of the database

Reminder :

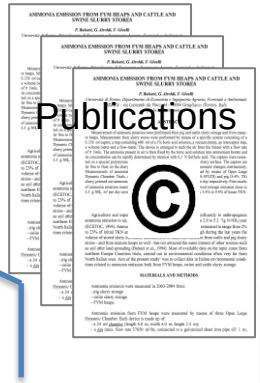
- The database includes data on gaseous emissions
- A data concerns gaseous emissions of NH3 or GHG (CH4, N2O) and CO2

Data from 22 countries



Europe America Australia Asia

Sorting and selection of the data of the database



Publications

Nb data		NH3	N2O	CH4	CO2
129	60				
	21				
	58				

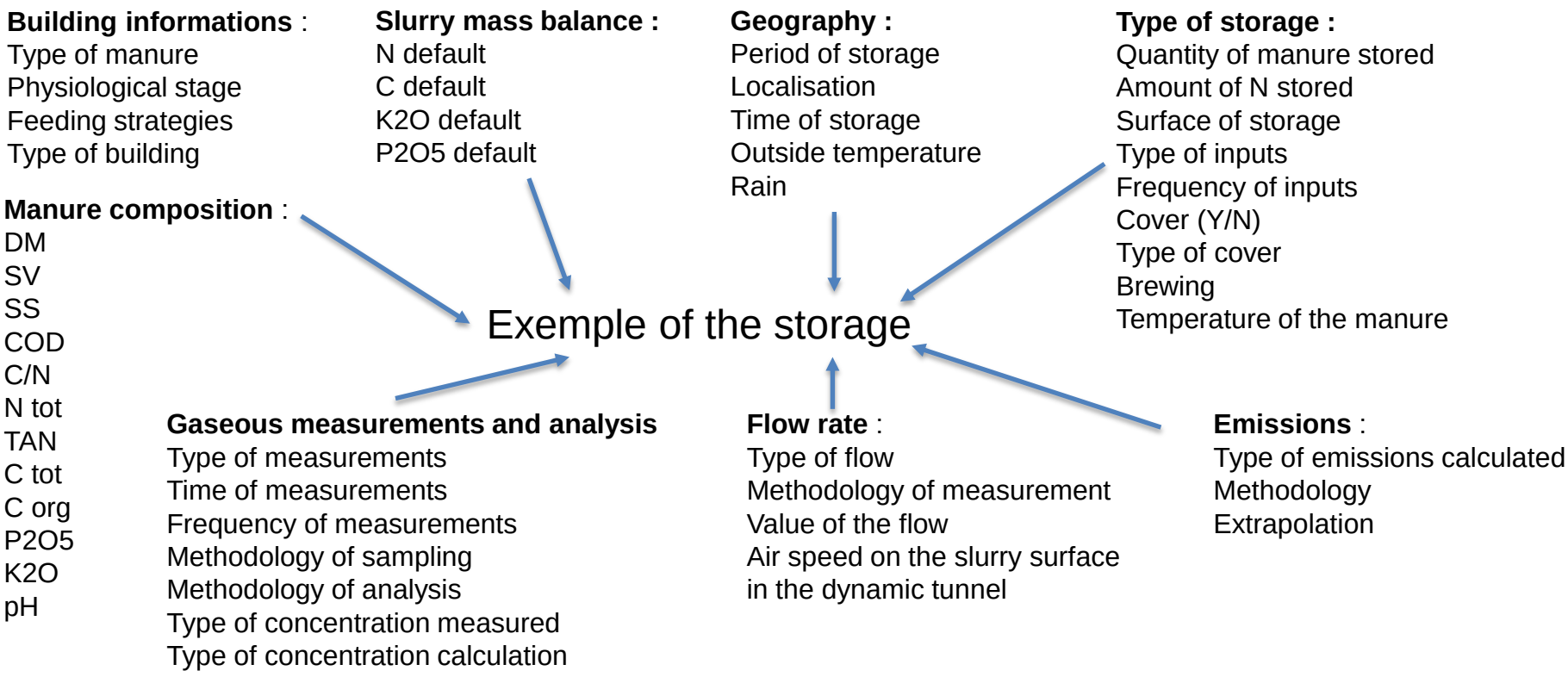
I : EF include

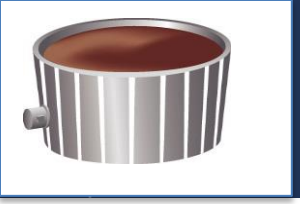
Causes of exclusions for treatment :

- Type of manure (slurry with straw)
- No information on manure composition
- Type of manure (mixed of pig and cattle)
- Time of experimental monitoring (< 1d)
- Type of manure (slurry with straw)
- No information on manure composition
- Type of storage (non representative of French conditions : lagune)

Informations collected in the database

- Information on the gaseous emissions
  - EF with the unit of the article
  - EF with standard unit
  - Emissions in % of the N or C input
- Metadata :
  - Nb for storage : 72
  - Nb for treatment : 62
  - Nb for spreading : 73

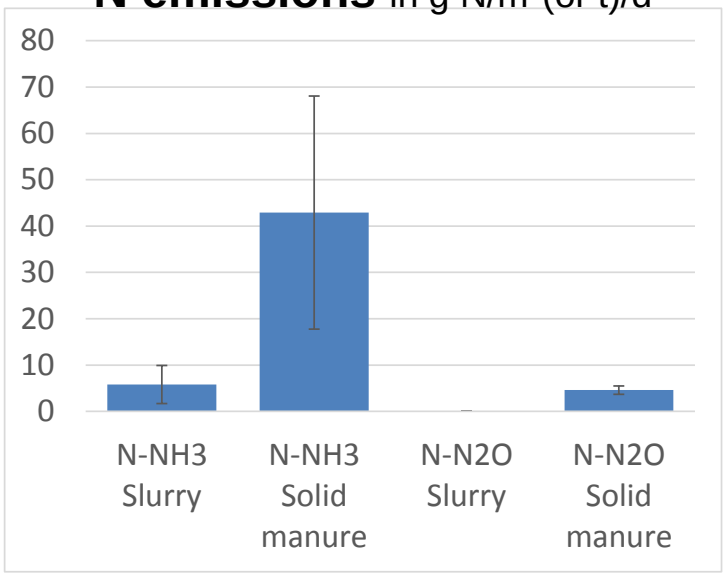




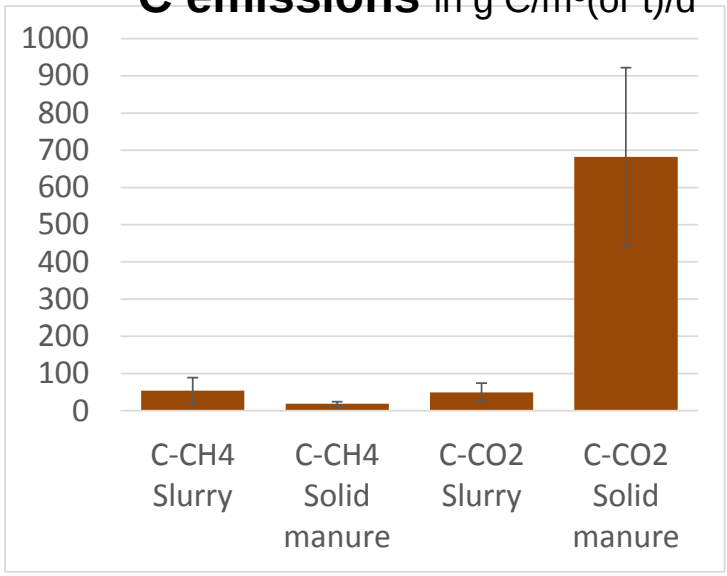
Emissions for storage (1)

SLURRY & SOLID MANURE

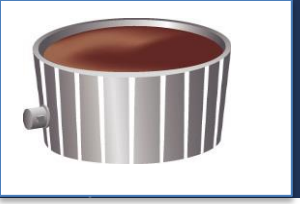
N emissions in g N/m³(or t)/d



C emissions in g C/m³(or t)/d



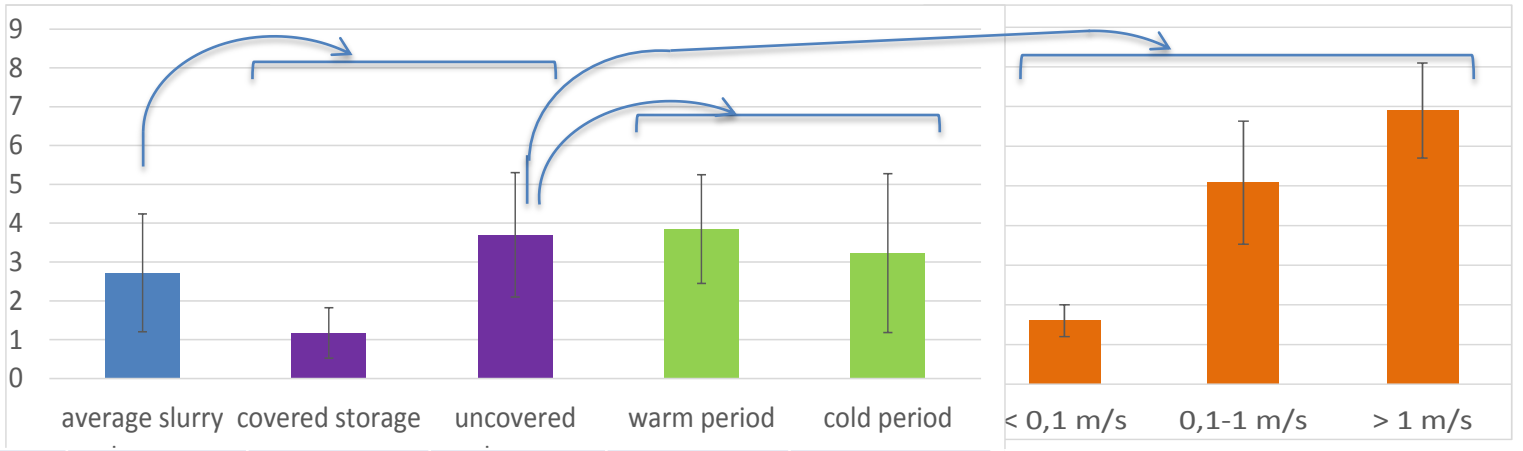
- Unit selected to express results : /m³/d or /t/d = the main unit of the publications except for the emissions of NH_3 for the slurry (in m²/d)
- N emissions of the solid manure higher than for the slurry.
  - Partly due to the duration of the emissions (less than one month for the solid manure and for several months for the slurry).
  - Still the emissions expressed in % of N input are higher for solid manure (17% of the N input) than for slurry (6%)
- CO2 emissions of the solid manure also due to the degradation of straw.



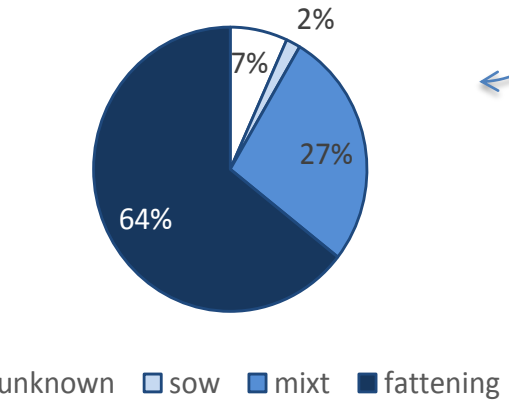
Emissions for storage (2)

SLURRY/NH3

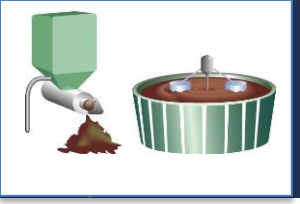
g N-$NH_3/m^2/d$



Nb data	59	26	32	20	10	5	5	5
N slurry composition (g N/kg)	4,5	5,4	3,6	3,4	3,9	3,9	3,4	4,2

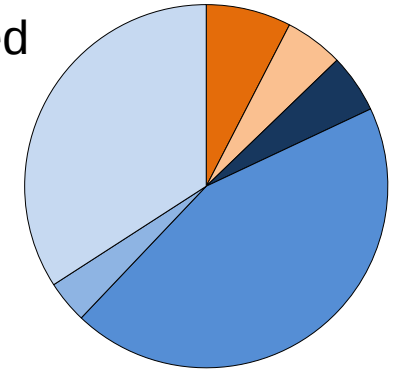


- The results confirm the incidence of main factors on ammonia emissions
  - presence of cover
  - temperature
  - air speed on the slurry surface
    - Main technique used to measure N emissions for slurry = a dynamic tunnel. Very few publications with the information on air speed and it is shown to be very important.
- Importance of the metadata (average composition of the slurry higher for some modalities because of fattening pig slurry)



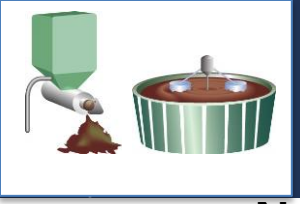
Emissions for Treatment (1)

Data selected



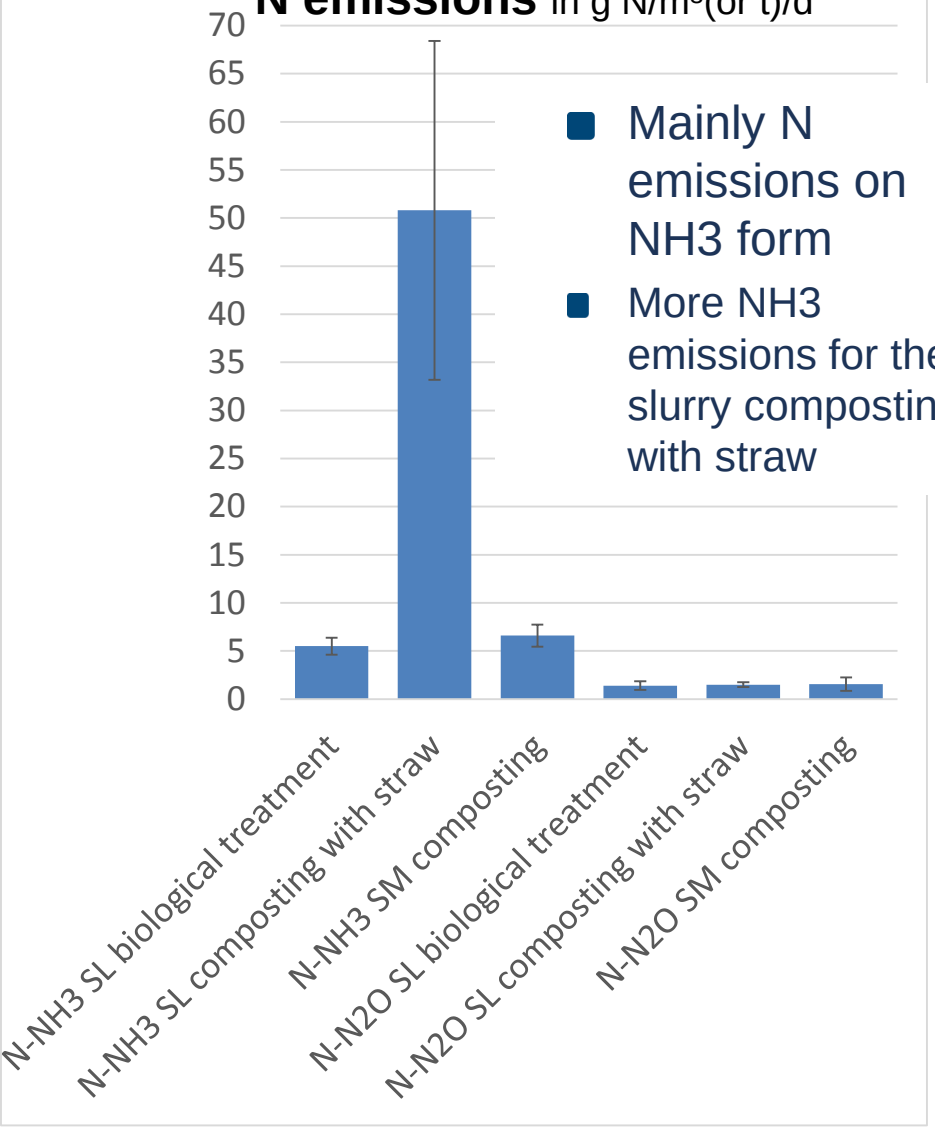
- Three main treatments in publications
  - Slurry
    - Biological treatment
    - Composting with straw
  - Solid manure
    - Composting

- 93 data concerning biological treatment but :
  - A lot of phases (phase separation, reactor, decantation, storage of solid phase of separation, storage of sludge, storage of supernatant)
  - All data come from a unique scientific team
- The data for treatment concern very different processes : few data per process



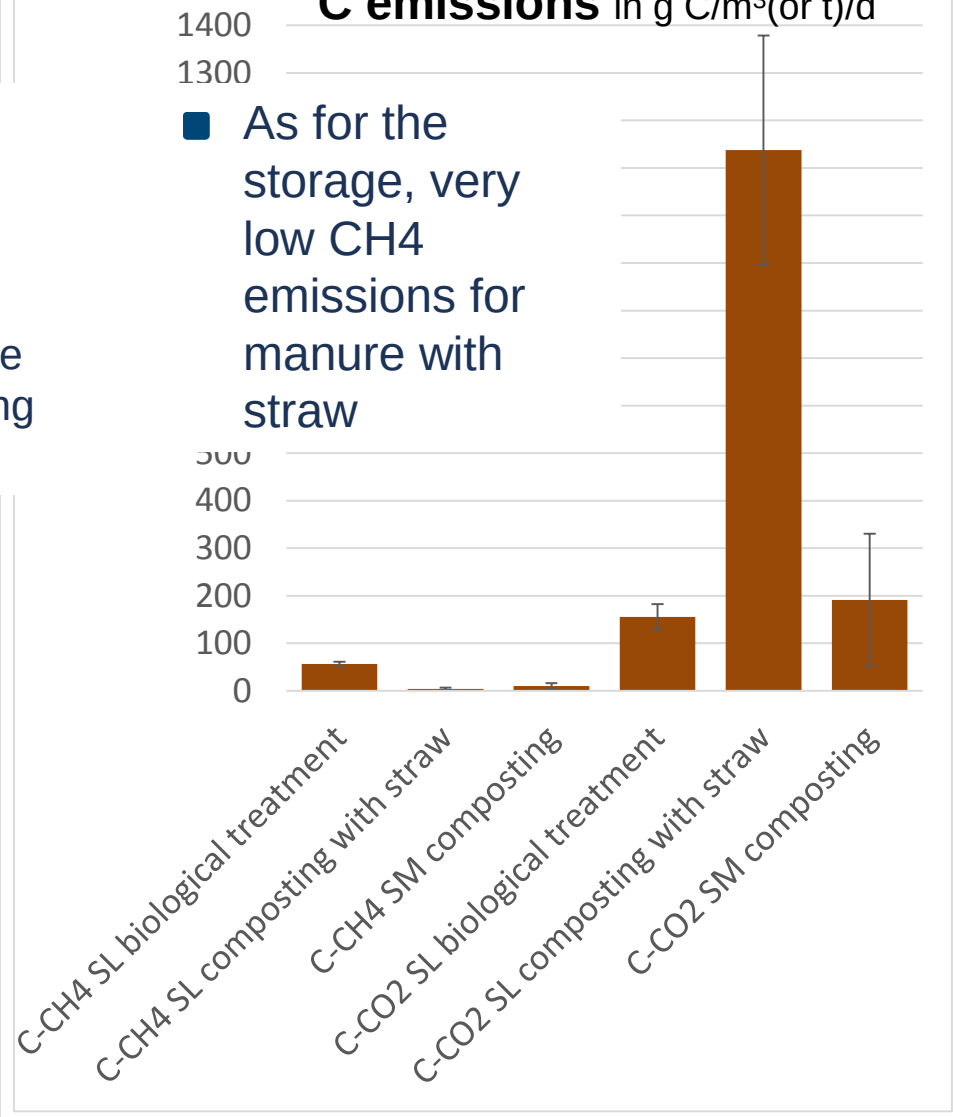
Emissions for Treatment (2)

N emissions in g N/m³(or t)/d



- Mainly N emissions on NH3 form
- More NH3 emissions for the slurry composting with straw

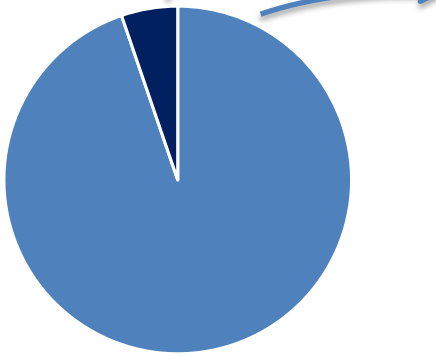
C emissions in g C/m³(or t)/d



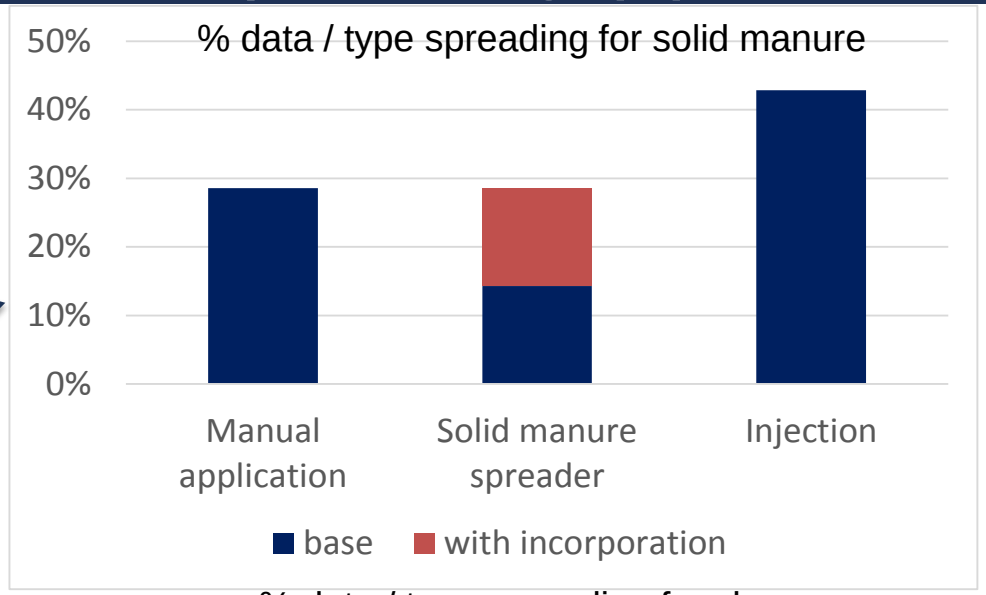
- As for the storage, very low CH4 emissions for manure with straw

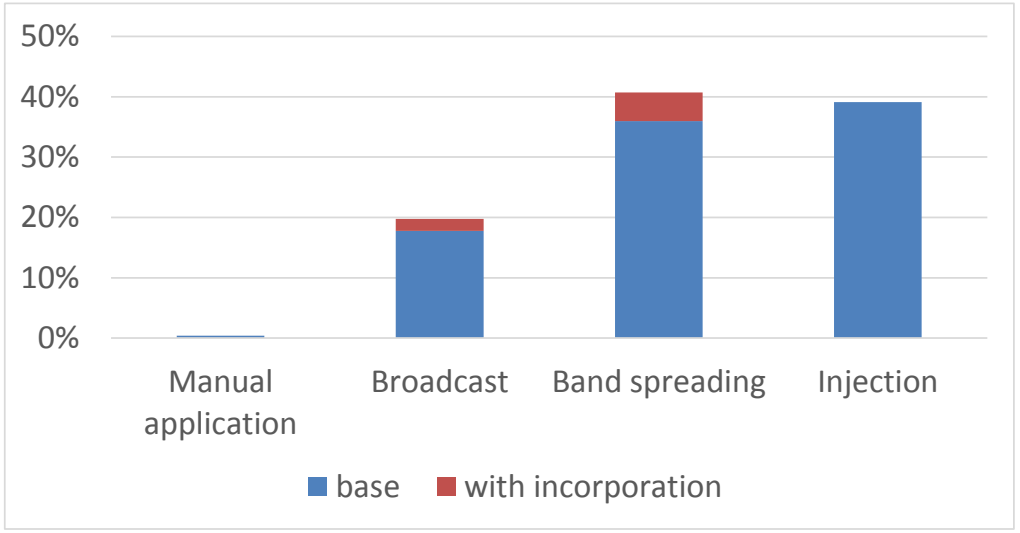
Emissions for spreading (1)

- Mainly data on slurry application (235 data selected vs 14 data for solid manure)
  - For all the different types of spreading



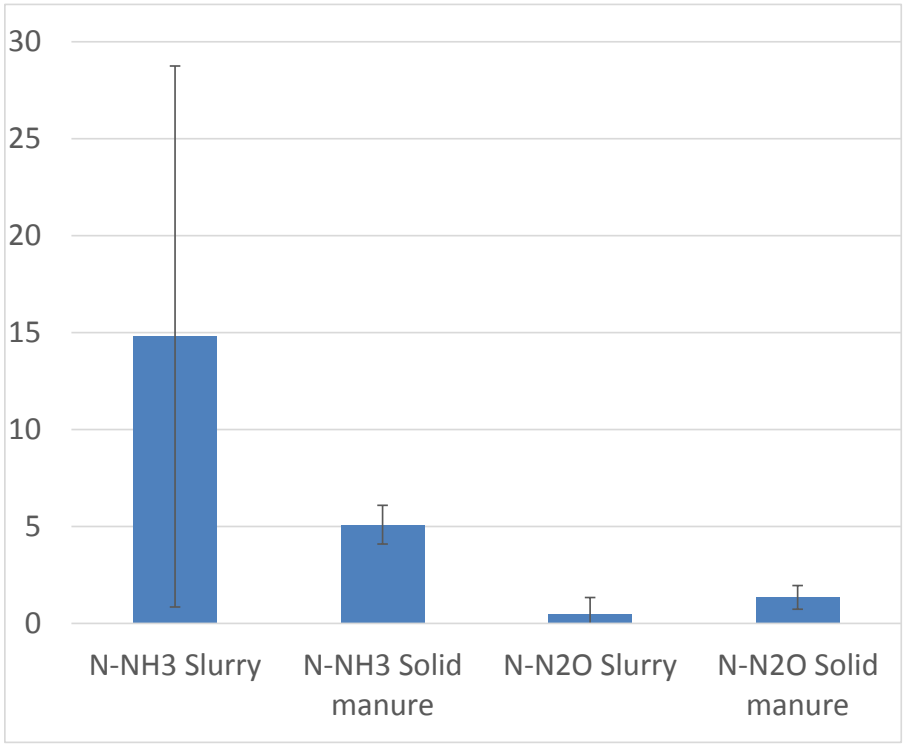
Data selected





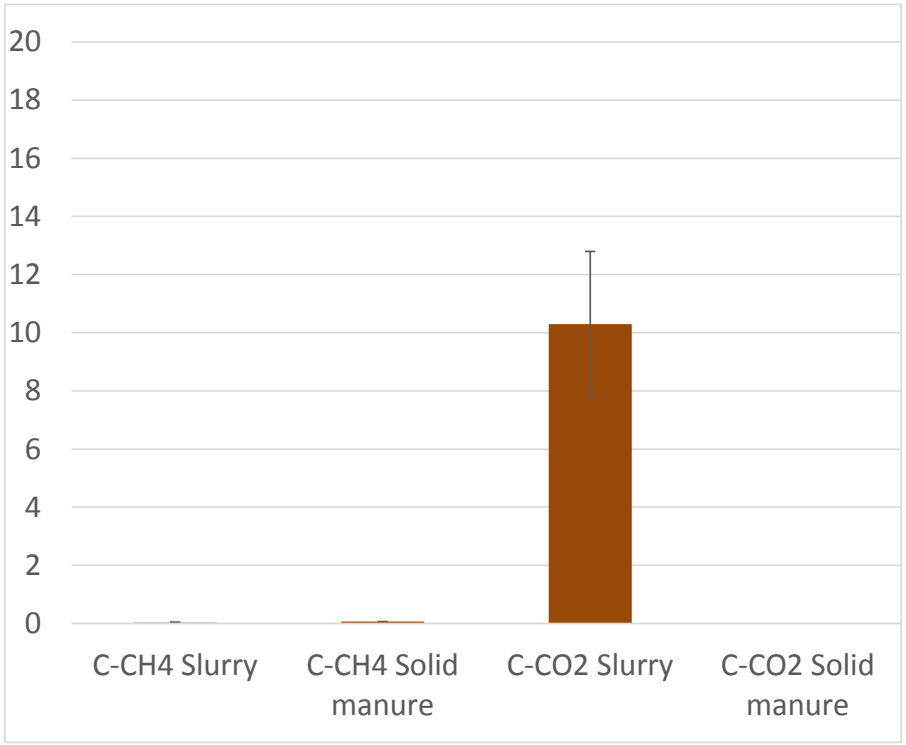
Emissions for spreading (2)

N emissions in g N/ha/d



- Mainly N emissions on NH3
- Emissions higher for slurry than for solid manure but with a very important variability

C emissions in g C/ha/d

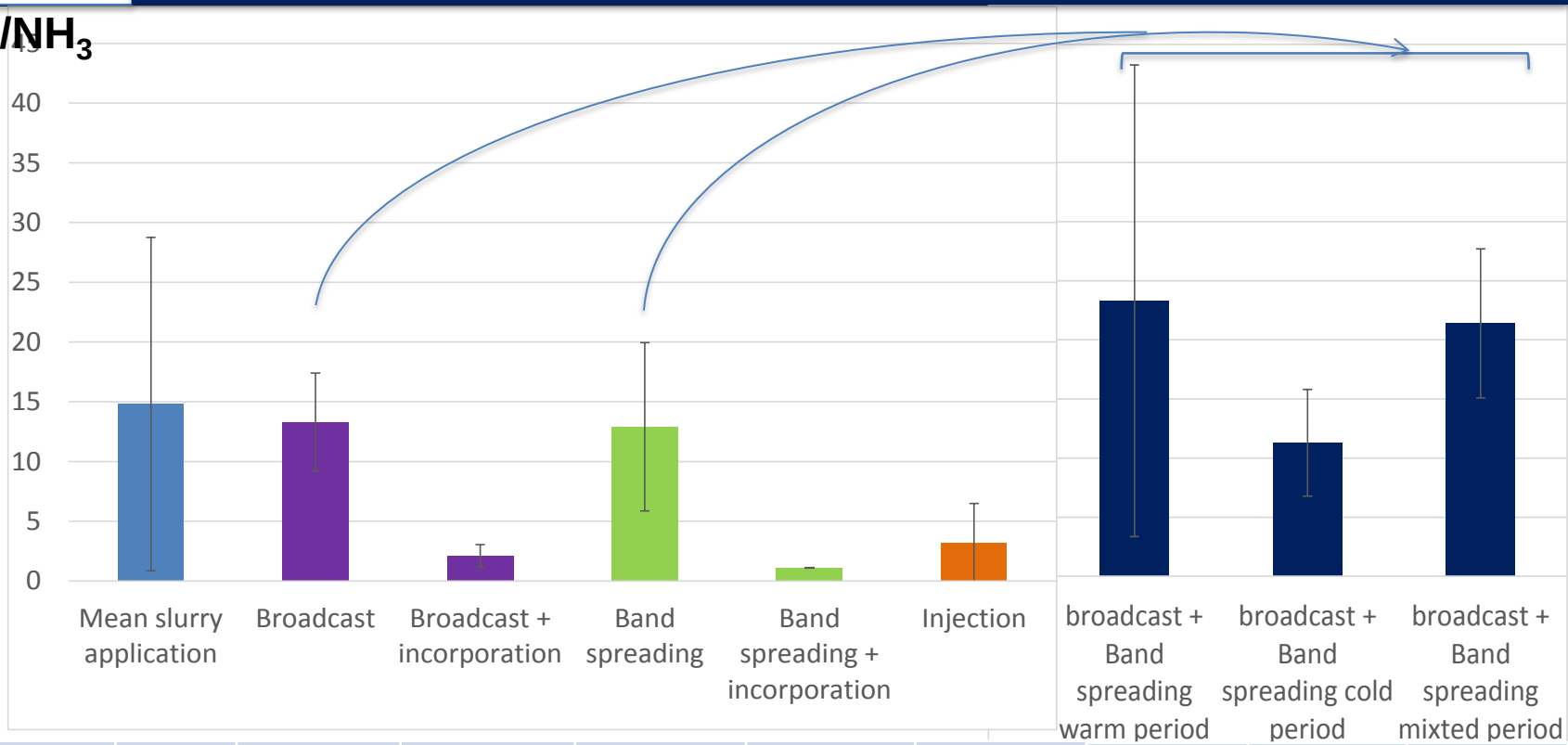


- No CH4 emissions during spreading.
- No data on CO2 emissions of solid manure during spreading

Emissions for spreading (3)

SLURRY/NH_3

g N-NH_3/ha/d



Nb data	135	21	5	63	2	32	51	24	19
Application rate (m^3/ha)	36	43	34	41	56	41	40	34	41
Nitrogen input (kg N/ha)	136	160	78	127	113	135	147	129	127

- Results confirm the incidence of the type of spreading on NH3 emissions
- Again : importance of metadata on the application rate and the nitrogen input per ha

Conclusions – Part 2

- N : main losses on NH3
  - during storage of solid manure (18%)
  - During spreading of slurry (16%) and solid manure (14%)
  - During treatment by composting slurry with straw (30%)

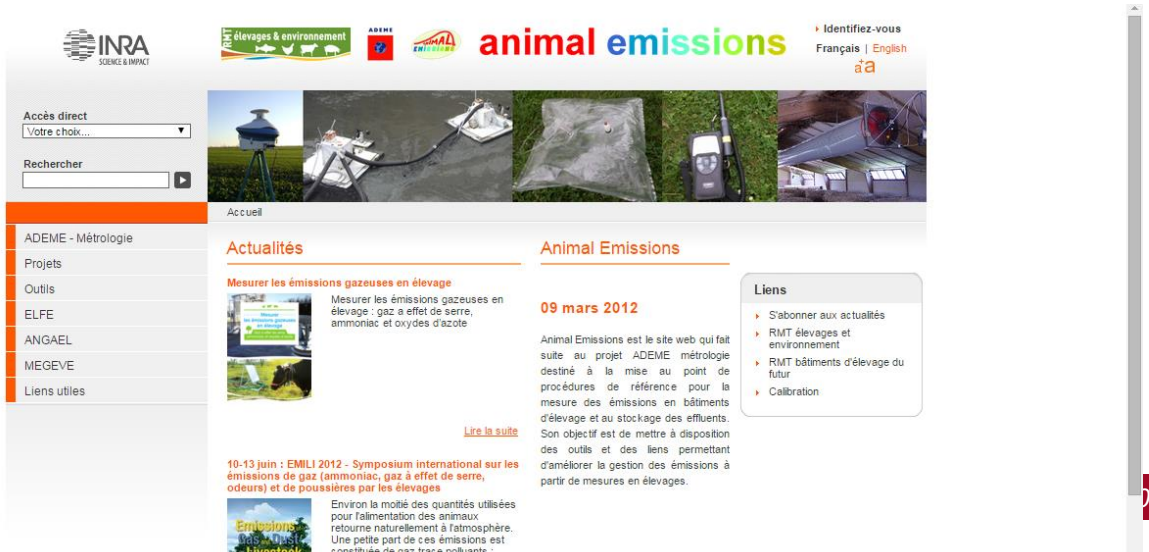
- Important lack of data
  - Less than 10 data for
    - storage of solid manure
    - spreading of solid manure
    - For all process of treatments
  - Composition of slurry, measurement duration, air speed for storage

Global conclusions

- Several steps : building, storage, spreading and treatment
- A big lack of informations
- Most of the times on very influent parameters (nutritional strategy, manure management….)
- Great technical diversity in pig farms = increasing the number of EF to define pig farms in inventories
- Data base = useful tool to identify « black boxes » and to achieve new studies…

Perspective

- Updating our tool
- Merging with others database developped by partners
- Pigs but also poultry and cattle production
- Not only NH_3 and GHG but also on particles and odors
- Future tool in english
- One name to remember : **ELFE**
- https://www6.inra.fr/animal_emissions/ELFE



Thank you for your attention

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