

On the impact of inventory uncertainties on Non-CO₂ Greenhouse gas emissions reduction options

M.A. Hilhorst¹, R.M de Mol¹ & C.J.H. Cozijnsen²

¹IMAG, Wageningen, The Netherlands, m.a.hilhorst@imag.wag-ur.nl

²Consulting attorney, Utrecht, The Netherlands, info@emissierechten.nl

Uncertainty of agricultural emission inventories

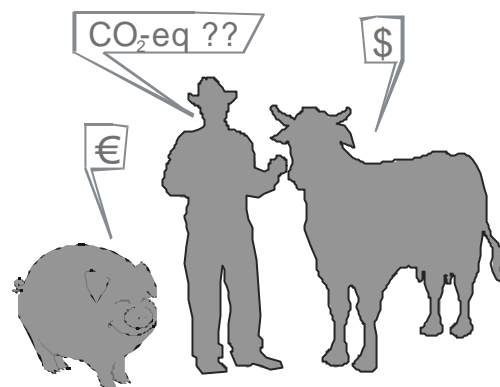
Current estimates for NCGG emissions of agricultural sources are rough and uncertain.

Uncertainties according to the Dutch national inventory (RIVM, 1998):

- CH₄: 25%,
- N₂O: 35%,
- CO₂: 2%.

Sources are highly sensitive to:

- farmer's individual management practices,
- local circumstances, and
- physical conditions like pH or temperature of manure and soil.



Observations

Observations for CH₄ emissions:

factor	observed variations	included in IPCC models?
pig farms (management and system)	8 to >30 g/day per pig	no
dairy farms (management and system)	250 to 850 g/day per cow	no
yearly weather variations (dairy farms)	MCF 6 to 13%	no
division of manure between indoor and outdoor storage	MCF 1 to 12%	no
pH of slurry	sensitivity: -5% per +0.1 pH slurry pH: between 7.2 and 8.4	no
temperature of slurry	-66% from 20 °C to 10 °C	rough: cool, temperate, warm

Other factors leading to uncertainties:

- Organic farming may lead to the use of straw in the animal housings, which in turn leads to increased N₂O emissions.
- Separation of liquid and solid fractions of manure will gain the need for composting of the solid fraction which in turn will lead to increased CH₄ and N₂O emissions from composting and decreased CH₄ emissions from storage.
- pH, temperature, tillage method, type of soil and crop have significant effect on N₂O emissions after manuring and fertilization. Uncertainties of 50-100% are reported by Kuikman et al. (2000).

Discussion

Emissions trading can increase farmer's income. Non-agricultural parties with high marginal reduction costs can purchase emission reduction units from farmers for 10 € per ton CO₂eq. to >30 € near the end of the first Kyoto commitment period (2012).

Inventory uncertainties are often seen as a complicating factor in emissions trading. However, the large emission variations between farms do result in relatively large variations in added income which can be a driving force to stimulate the farmer to find and implement the most cost-effective reduction options including CO₂-storage techniques and the use of renewables.

Conclusion

Due to large emission differences between farms emissions trading might be a strong instrument to reduce agricultural CH₄ and N₂O emissions. Emissions trading require simple and cheap monitoring facilities.