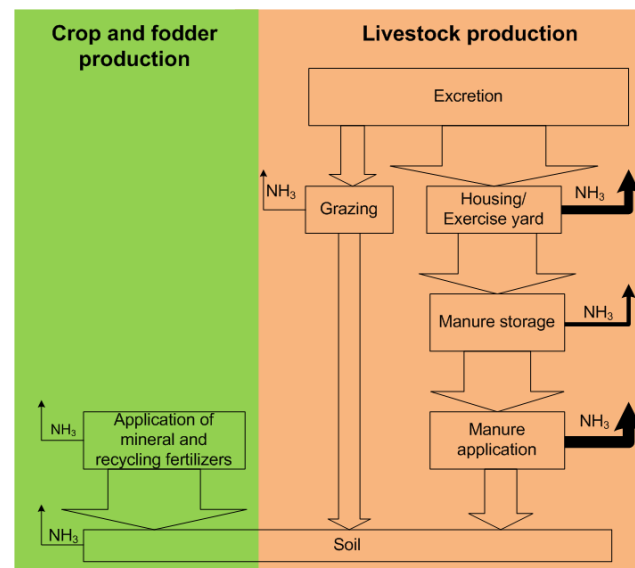


Swiss methodology for agricultural ammonia emissions and assessment of mitigation options

44th TFIAM meeting
Edinburgh, 6-8 May 2015



Agricultural emission model for NH₃



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Model input from farm surveys

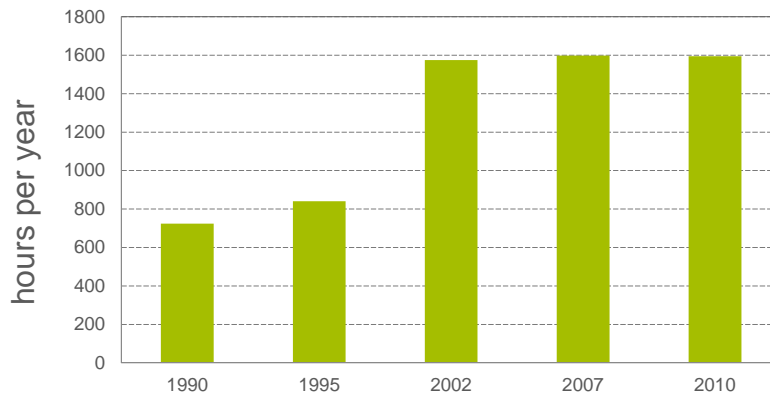
- representative surveys on production techniques and manure management carried out in 2002, 2007 and 2010; next one in 2015
- stratified random samples covering approx. 4000 - 6'500 farms (7 - 11% of total)
- stratification accounting for 5 farm types, 3 geograph. regions and 3 altitude zones (32 farm classes)
- questionnaire containing 300 questions on feeding practice, grazing time, housing systems, manure storage and application
- return rate approx. 50% regarding completed questionnaires

Procedure of emission calculation

- Emission calculations for 2002, 2007 and 2010 were individually performed for each farm included in the survey
- For each of the 32 farm classes (region x altitude x farm type) and for each livestock category a weighted average emission factor per animal was calculated
- Upscaling of livestock emissions to the national level using statistical data on livestock numbers
- For 1990 and 1995 a simplified calculation at the national scale was performed



Grazing time for dairy cows



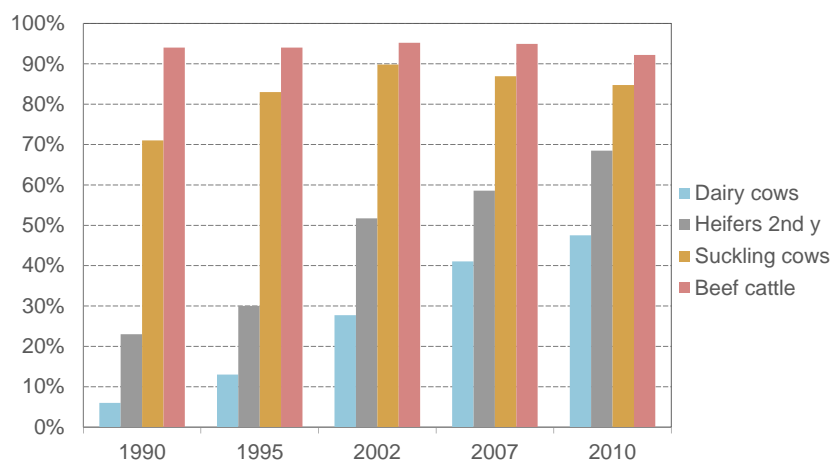
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Housing systems for cattle

Proportion of cattle kept in loose housing systems



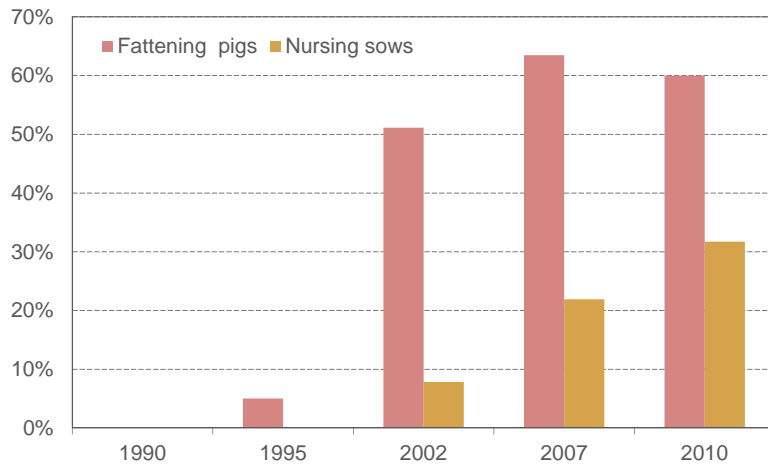
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Housing systems for pigs

Proportion of pigs kept in animal-friendly systems
(multi-area pens and outside yards)

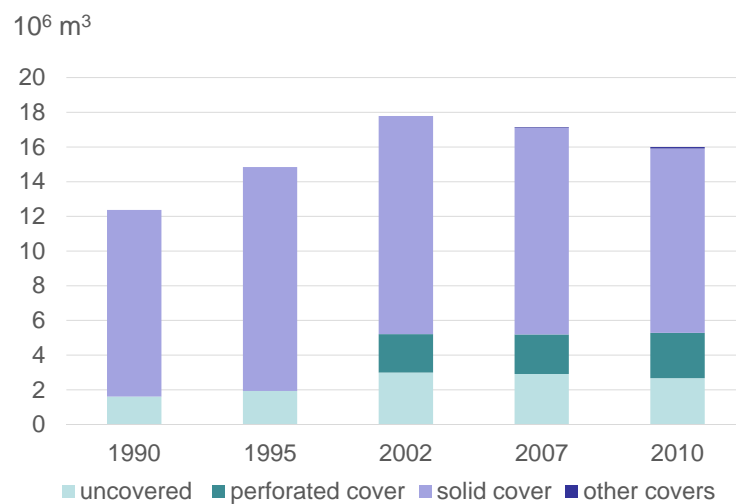


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Slurry storage capacities & cover types



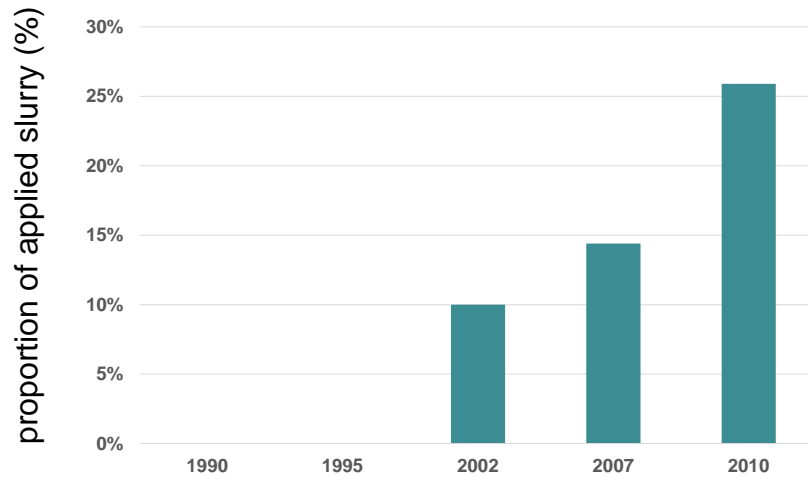
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Low-emission slurry application

(mainly trailing hoses)



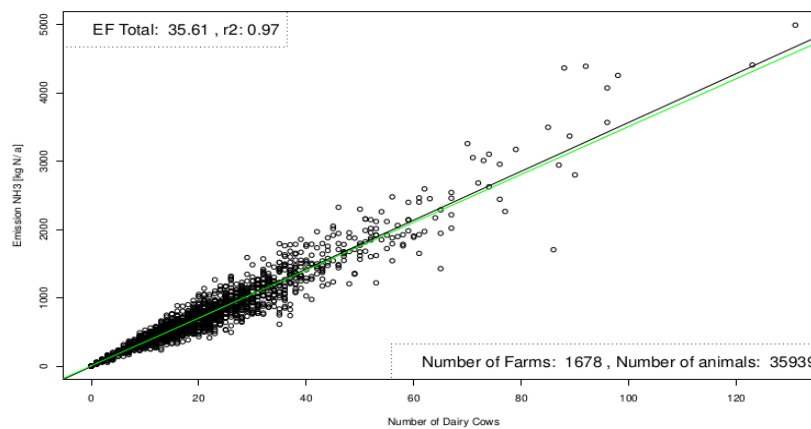
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Calculation of average emission factors

02.07.12 , 2010 v6.2 : Dairy Cows

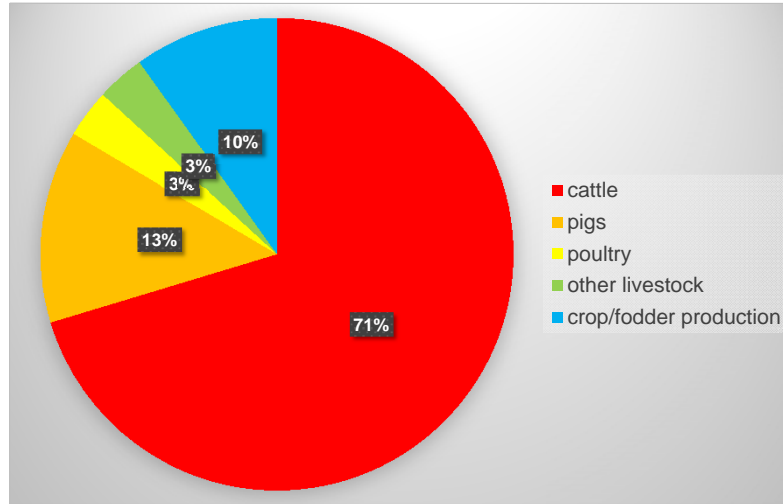


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NH3 emissions from agriculture 2010

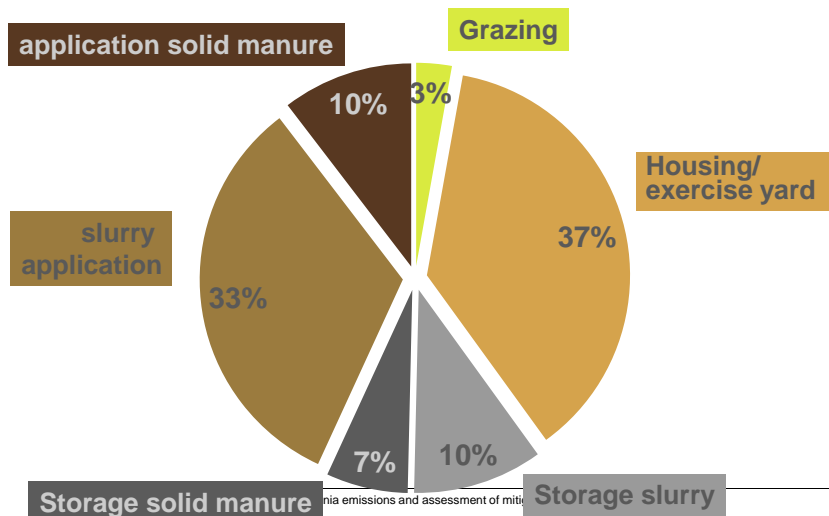


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Ammonia emissions from livestock production 2010

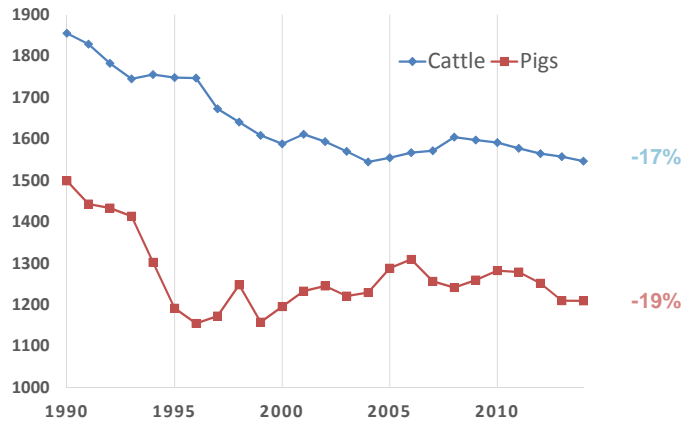


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Livestock numbers (1000 heads)

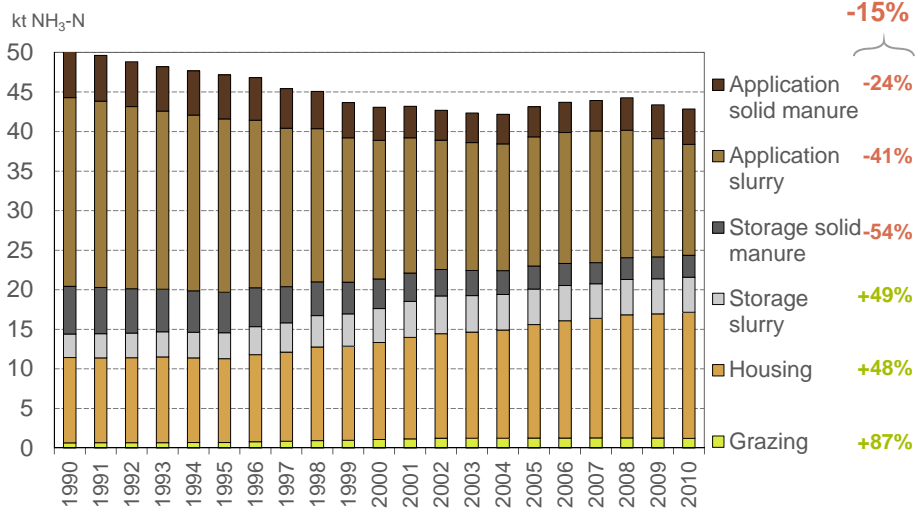


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NH₃ emissions from livestock production 1990-2010



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Factors influencing emission trend

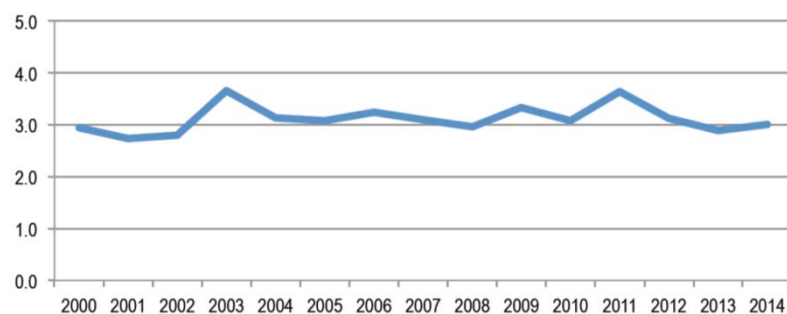
- NH₃ emissions from agriculture decreased by 17% between 1990 and 2010
- trend of NH₃ emissions influenced by trend of animal numbers, changes of farm production techniques and manure management
- main drivers are regulations of agricultural policy promoting animal welfare and incentives for better resource efficiency :
 - increasing proportion of grazing for cattle
 - replacement of tied housing by loose housing systems for cattle
 - animal-friendly pig housing systems
 - increase of storage volume for slurry and coverage
 - use of low emission techniques for slurry application

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Ambient concentrations of NH₃ (µg/m³)

annual average of 16 stations

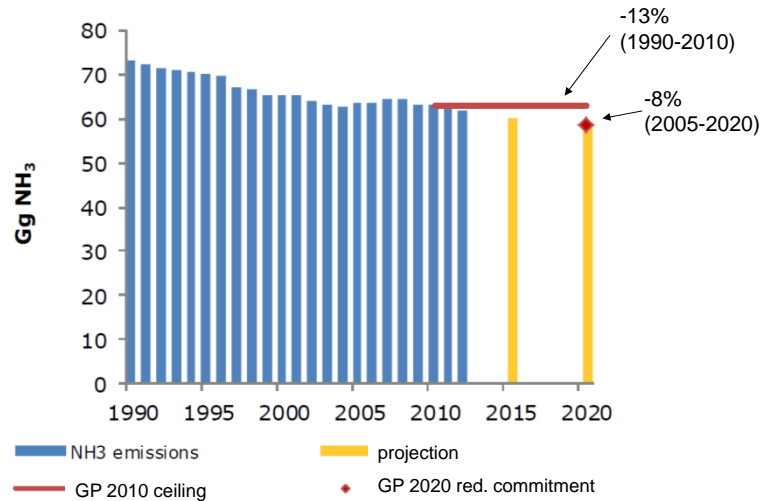


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NH₃ emissions and projections



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Assessment of mitigation options and emission reduction potential 2030

3 scenarios

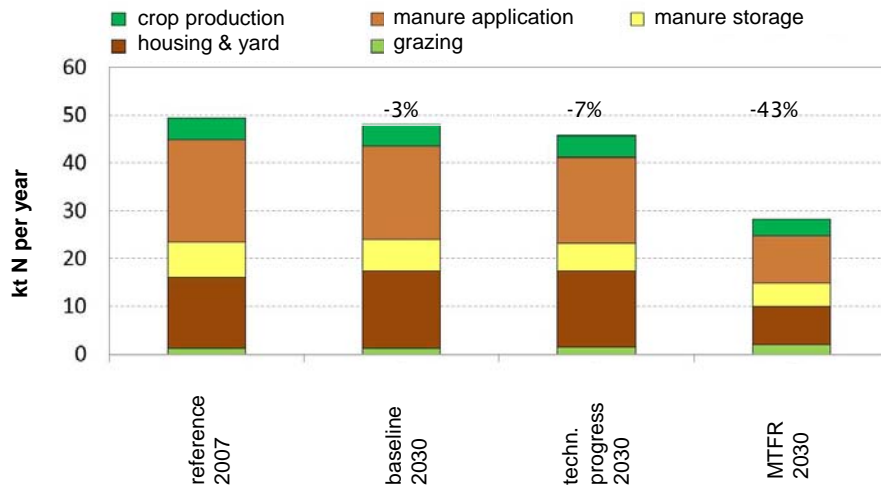
- 1. Baseline:** slight decrease in livestock numbers versus reference year 2007; no change in production techniques
- 2. technical progress (incentives) :**
 - low-emission slurry application
 - housing adaptation (category 1 techniques)
 - air scrubbers, biofiltration for pigs and poultry
- 3. MTFR:** maximum technically feasible reduction (with constraints concerning applicability)

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Emission reduction scenarios



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Thank you for your attention!

web-based model for single farms and regions:

www.agrammon.ch

Acknowledgements

- Thomas Kupper (HAFL)
- Cyril Bonjour (Bonjour Engineering)
- Fritz Zaucker (Oetiker + Partner)
- Harald Menzi (Agroscope)
- Beat Achermann (FOEN)

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