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  - Data needed for nutrient management on farms
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Data on farm scale

- **N inputs**
  - N in feed, fertilizer, manures
  - Availability of N in fertilizer and manures

- **N outputs**
  - N in animal and crop products
  - Yields and N contents

- **N cycling and losses in farming systems**
  - Losses: gaseous losses (ammonia, denitrification and leaching/surface runoff)
  - Mineralisation in soils
Developments i): chemical analyses

- New and rapid methods to analyse soil samples
  - Near-infrared (NIR) spectroscopy
  - Simultaneous and rapid analysis of nutrients and soil properties in one soil sample
  - Fertilizer recommendations can be based on interactions between nutrients and soil properties
ii) Precision fertilization techniques

- 3S technology rapidly evolving: GIS, RS and GPS
  - Geographical Information System (GIS)
  - Remote sensing (RS)
  - Global Positioning System (GPS)

- Use of rapid soil and crop tests
- Use with weather data and projections
- Crop growth models

- Development of internet based Decision Support Systems: dynamic fertilization strategies
But .......

- Challenge: how to use these data to derive fertilizer recommendations for farmers

- Need of development of models and calculation methods
  - calibration/validation in field and pot experiments
N impacts are related to many EU policies
Data needs for monitoring of policies

1. Monitoring of calculated N emissions and N balances
   - Guidebooks with methodologies available
     - Ammonia: EEA/EMEP guidebook
     - Nitrous oxide: IPCC guidelines

2. Monitoring of measured N concentration in water and air
Calculation of emissions and balances

- Data related to N inputs and outputs
  - From statistics (national and Eurostat)

- Coefficients and N emission factors
  - Guidebooks and scientific literature
  - Need for country-specific data and coefficients

- Harmonisation of data collection and processing needed
  - Common approaches for member states
  - Agri-Environmental Indicators
    - Diredate project Eurostat, 2012
Example: excretion factors pigs in NIR 2011

Source: Velthof et al., 2015
Measurements of N in water

Differences in monitoring networks, e.g. water monitoring

**Source:** European Commission, monitoring Nitrates Directive
Conclusions (i) Agriculture

- Information about N is needed for optimal management of crops, animals and soil

- Lot of data is already available and new sources of information are emerging

- The challenge is to use data for nutrient management under practical farming conditions, taking interactions between factors and weather conditions into account
Conclusions (ii) Environment

- Need for quantification and monitoring of N emissions
- Methods for calculation of N emissions available
  - Defaults for data and coefficients available
  - Need for detailed and region/country specific data
- Monitoring of air and water quality
  - Monitoring networks not harmonized
- Potentials to harmonize data collection for different policies
Thank you!