Determining manure nutrient content in Finland

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Current system for manure quality

- Two options as defined by “Government Decree on the restriction of discharge of certain emissions from agriculture” (1250/2014), under Nitrates directive (91/676/EC)
  - Farm-specific manure analyses min. every five years
  - Table values
    - Based on manure analysis data from two commercial laboratories; Lab 1 - 13 500 samples; Lab 2 – 4 600 samples
- Applies to all farms
  - All Finland nitrate vulnerable zone
- These two options are also included into the voluntary agri-environmental support scheme of the Rural Development Programme 2014-2020.
- Simple and understandable, but significant room for error

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Current system for manure quantity

- Manure quantities/volumes per animal (m^3/animal/yr) are calculational.
- Were updated in 2014 by Luke & SYKE
  1. Starting point: animal feeding and productivity data => excretion of urine and faeces
  2. Addition of cleaning water and bedding materials (depending on the housing system)
  3. Transformation from masses to volumes
     - volume weights of different manures were obtained from manure analysis data of the two commercial laboratories
  4. For solid manures, a rough estimation of 20% decrease in volume due to spontaneous composting during storing is included.
- Other mass changes are not included in the animal-specific figures
  - Precipitation and evaporation during storing are considered when manure storage capacity is calculated. Depends on the type of storage covering.
  - Emissions (e.g. ammonia) are not taken into account at this point.

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Quality: Challenges with farm-specific manure analysis

- Subject to error in many steps
  - Sampling
  - Sample preservation
  - Sample pre-treatment
  - Analysis
  - Differences between laboratories and/or analysis methods
- Example of cattle slurry data from two commercial laboratories (next slide)

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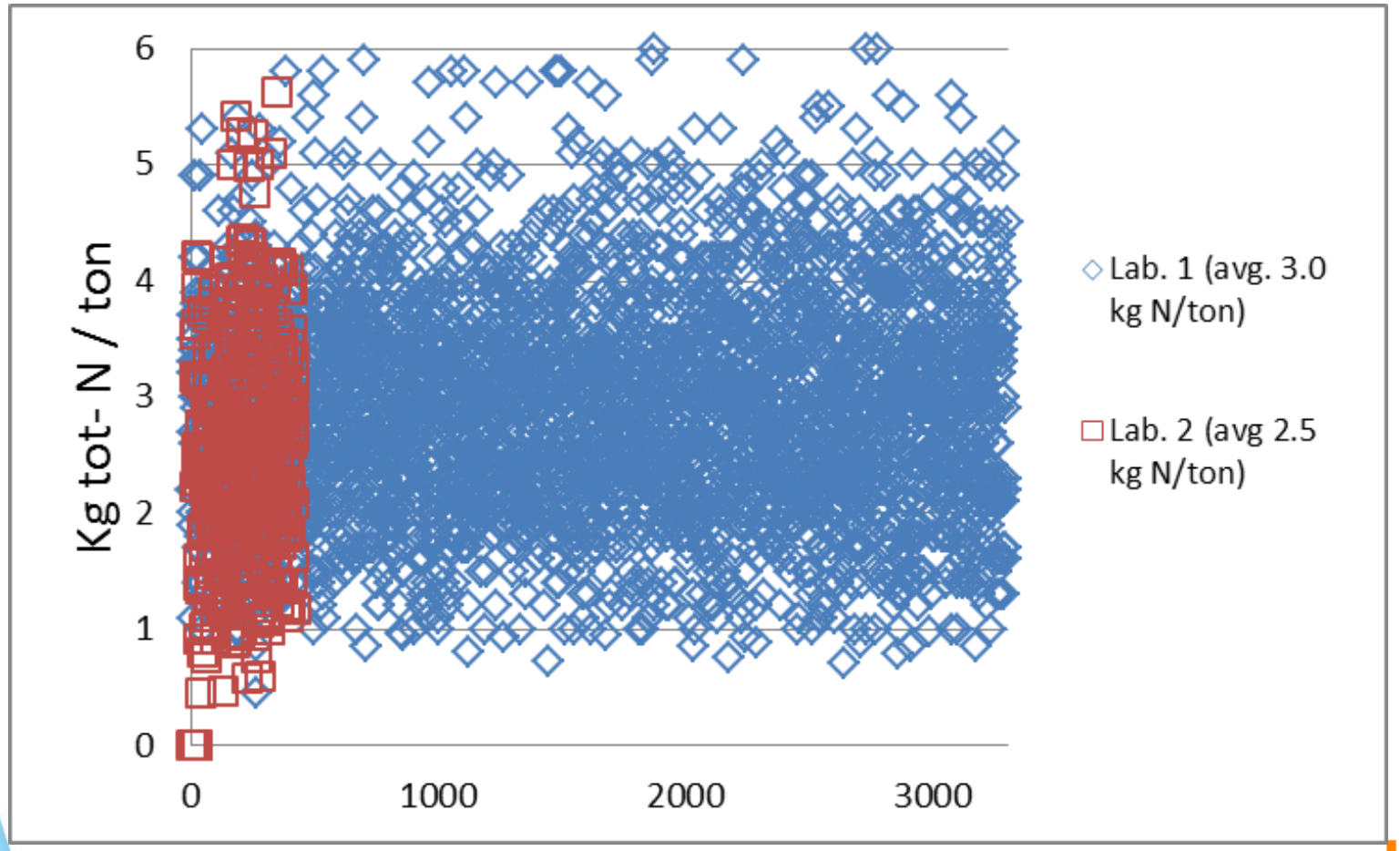
Example of cattle slurry data from two commercial laboratories (~2005-2011) - Total nitrogen (kg N/ton)



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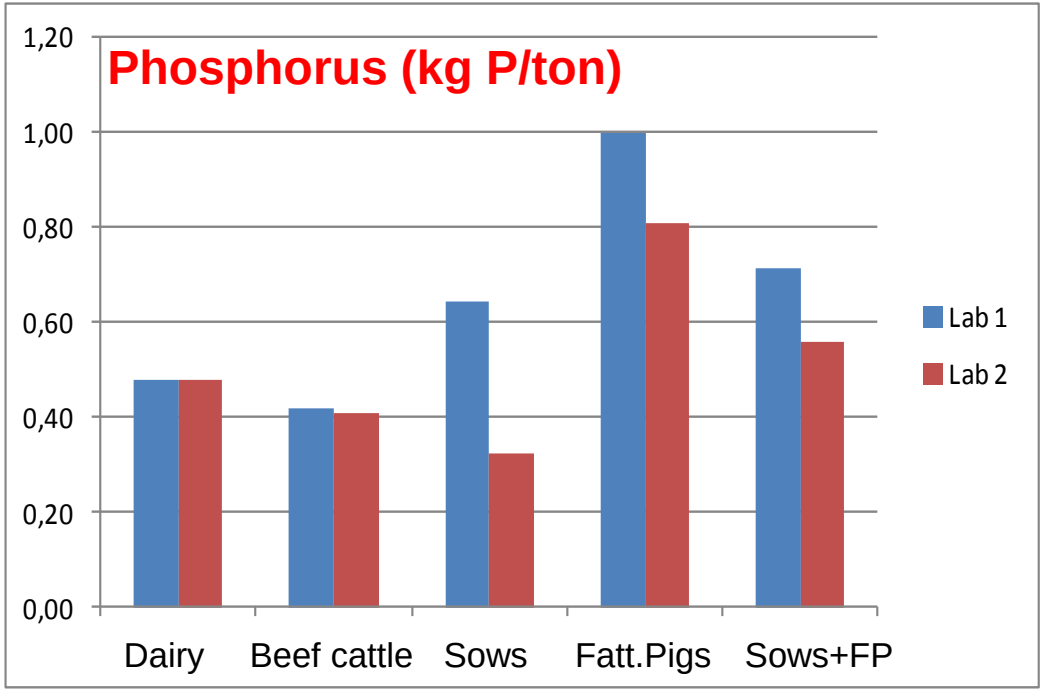
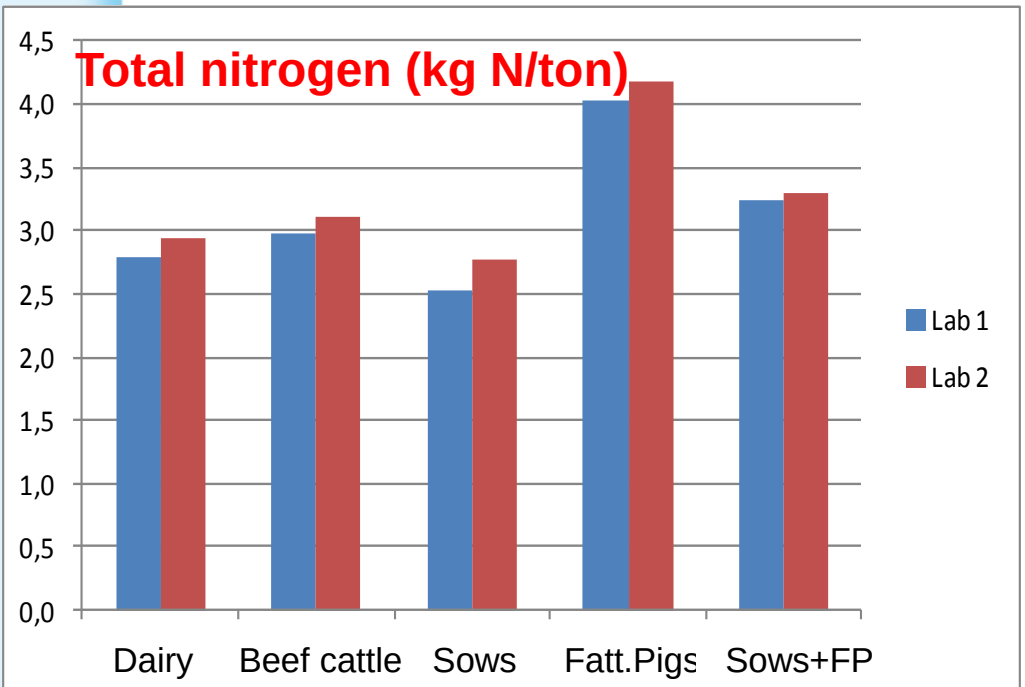
Slurry samples from:

- 10 dairy farms
- 5 beef cattle farms
- 4 farms with fattening pigs
- 2 farms with sows
- 4 farms with fattening pigs and sows

Same samples analysed in two laboratories.





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Challenges with table values

- Limited to only few animals and manure types
  - no consideration of breed, age, feeding, housing type etc.
- Practices within farms may vary significantly
  - e.g. water usage and bedding choice and amount.

Animal	Manure type	Total P (kg/m^3)	Soluble N (kg/m^3)	Total N (kg/m^3)
Cattle	Solid	1.0	1.1	4.0
	Slurry	0.5	1.7	2.9
	Urine	1.0	1.5	2.5
Pig	Solid	2.8	1.2	4.6
	Slurry	0.8	2.2	3.4
	Urine	0.2	1.3	2.0
Sheep / goat	Solid	1.3	1.0	4.9
Horse	Solid	0.5	0.4	2.6
Laying hen	Solid	5.6	4.2	9.4
Broiler	Solid	3.6	2.7	8.7
Turkey	Solid	4.4	3.2	8.0
Fox	Solid	12.7	1.4	6.5
Mink	Solid	12.1	0.9	5.2

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One possible improvement:

- Continue with the farm-specific manure analysis
  - More frequently than every five years?
  - Improved guidelines for manure sampling
  - Improved manure sample identification
    - When samples are sent to laboratory
    - Not ”poultry manure” but ”broiler manure” etc

=> more precise data for ”single farm manure properties” but also for table values

- NOT using either farm-specific analysis results OR table values as a basis for fertilisation, BUT calculating **mean** values using farm-specific results AND table values, and using mean values when planning fertilisation with manure.

=> compensates possible errors during sampling; considers farm-specific features.

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A normative manure system under development

- A system calculating manure **quantity** and **quality**
  - ex animal: faeces and urine depending on feeding
  - ex housing: different manure types, incl. bedding, waters etc.
  - ex storage: stored manure to be spread on field
  - Emissions/losses included (linked to the national emission inventories)
- Possibility to calculate separately for different animals
  - e.g. not only cattle, but dairy cows, heifers, calves of different ages, bulls, suckler cows separately
- Possibility to consider farm-specificity
  - Different feeding choices
  - Different bedding materials, water use, storage
- ➢ An equal and documented database for all users / uses

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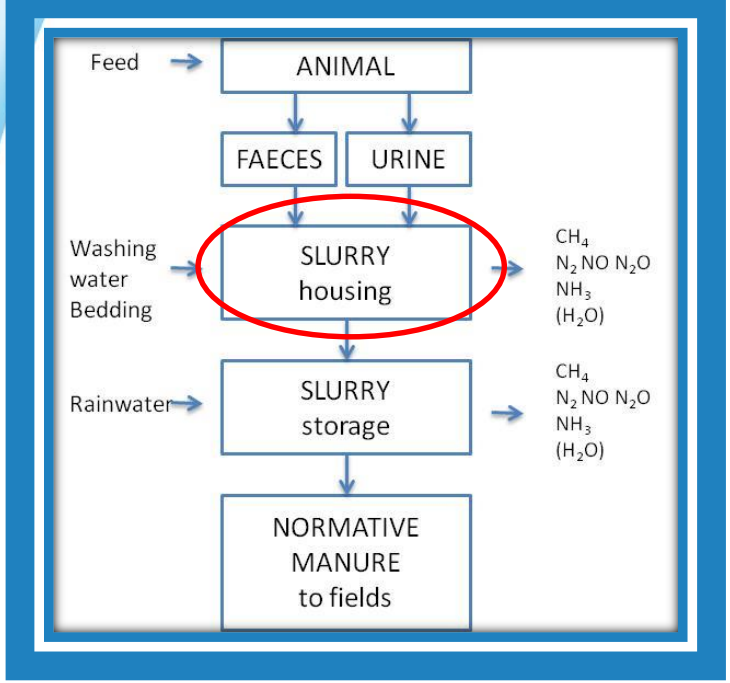

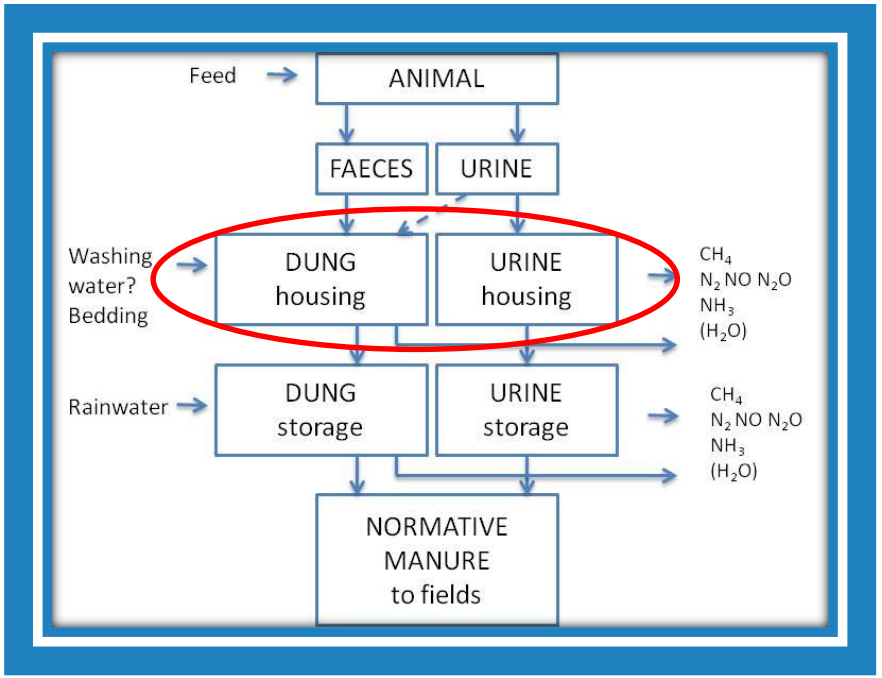

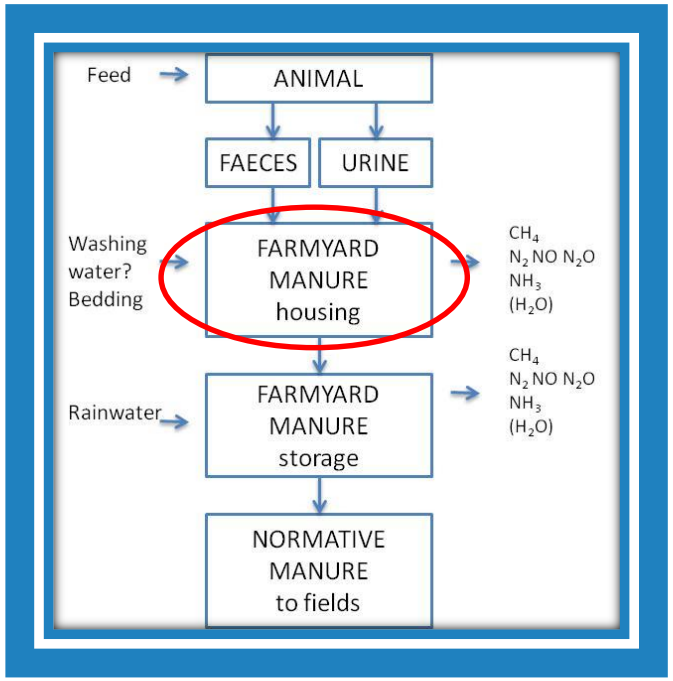

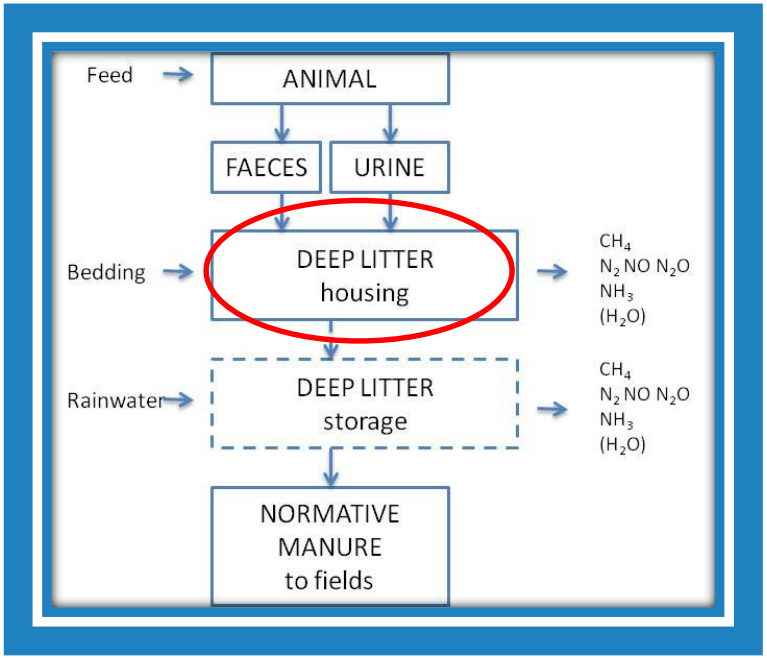

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Challenges of a normative manure system

- Complex model for multiple management options in variable conditions
  - Excretion calculation integral: many choices for feeding
  - Large number of animal categories and manure types
  - Data on national manure management required
- May seem too complex
  - Need for cooperation and dialogue between stakeholders to become acceptable
  - Must be well-documented and transparent
- Need for regular update
  - Clear routines: responsible organisations, schedule, data collection

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Thank you!

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