

## Simulate land management at the 10 x 10 km<sup>2</sup> grid cell level



### Common database, 10 km grid:

- crop coverage
- total fertilizer, manure
- total no. animal units

### DAISY simulations

spring cereal

winter cereal

....

.....

Maize

### Detailed land management data from type watersheds

#### Management strategy

- mineral fertiliser only
- extensive fertilization
- intensive fertilization
- fallow
- catch crops

#### Statistical data

- for each climate zone
- for 3-6 dominating soil types
- for representative climate stations

# Farm scale modelling

## Physiographic drivers

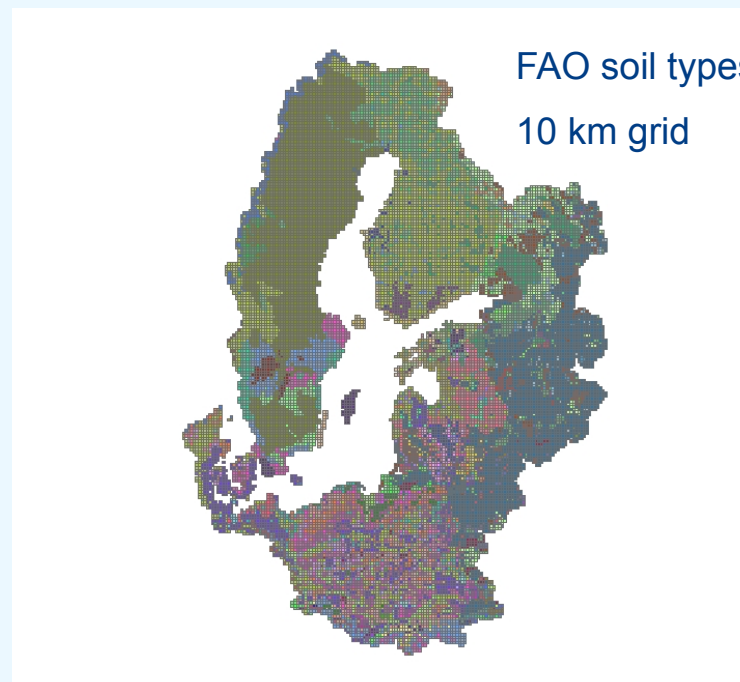
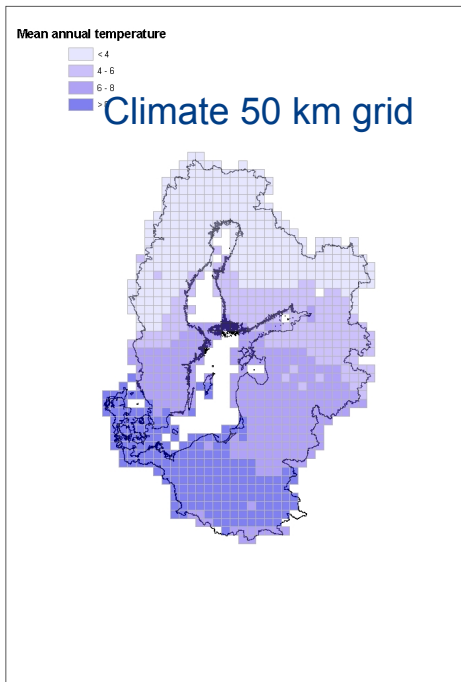
4 climate zones defined based on annual temperature

3 climate stations selected for each climate zone representing precipitation range

3 or 5 dominating soil types identified for each climate zone

## Management

Agricultural management described by 4 different strategies within each climate zone. Strategies parameterized from national statistics, management information available at a 10 km grid, and detailed information from type watersheds





## Data source:

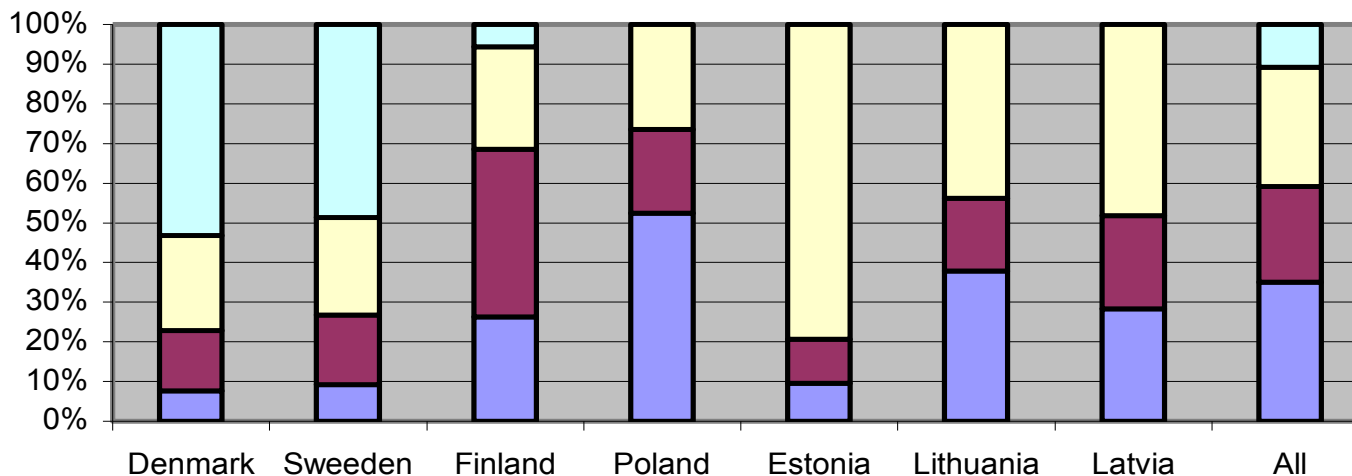
- › **Crop cover: Corine Land Cover 2000 – CLC 2000**
- › **Crop yield: EUROSTAT – NUT2 level**
- › **N content in crops: crop coefficients (OECD, 2007)**
- › **Mineral Fertilizer (10x10 km grid) ISPRA: International Fertiliser Association (IFA, 2006) (Grizzetti et al., 2007)**
- › **Manure N (10 X 10 grid) ISPRA: Nitrogen excretion coefficients (OECD, 2007) (Grizzetti et al., 2007)**
- › **Application of fertiliser to crops 3 different management: Benoist and Marquer, 2006a-h**



### Farm structure

	DK	SE	FI	P	LI	LT	ES
Agri. area (%)	60	7	7	42	36	20	17
Pct of agri. area							
Arable crops	69	41	60	72	45	42	72
Forage crops	17	33	28	6	26	23	6
Perm grass & m.	7	15	1	19	26	28	19
Fallow	7	10	11	1	3	6	1
Drainage	50		57	10	86		

■ <20    ■ 20-<50    ■ 50-<100    ■ ≥100



Distribution  
of farm size



# Check of data quality

- › **Mineral fertiliser on National level – adjustment for Poland, Lithuania, Latvia and Estonia**
- › **Manure nitrogen production – new calculation from livestock heads and excretion values from NANI report**
- › **Possible to calculate manure production related to management strategy at NUT2 level**



# Manure storage capacity and spring application

- › **From FAO expert work shop**
- › **storage capacity of slurry and solid manure**
  
- › **proportion of spring application from National references**



# Manure spreading technology

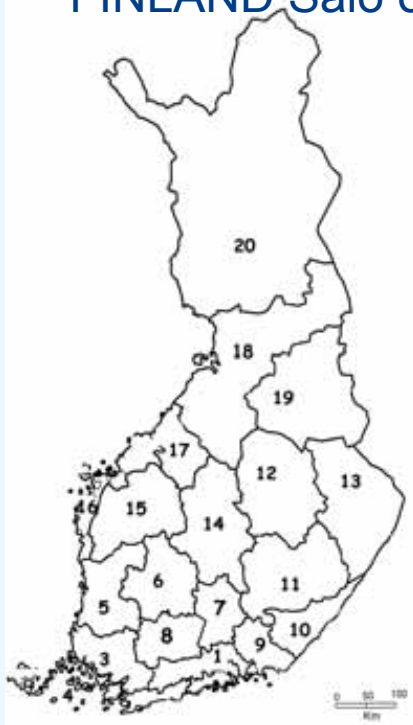


References from  
Denmark, Sweden and  
Finland

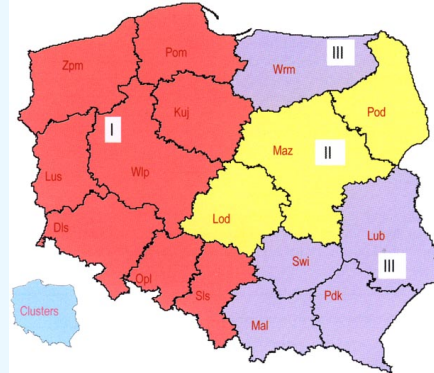
Low investment in  
these technologies in  
the other countries

## Regional N-balances for 1999-2001 to verify the Daisy modelling:

FINLAND Salo et al.,



POLAND – FAO, 2003



DENMARK – NERI

use of fertiliser and manure  
by district

SWEDEN – National Statistics

LATVIA– National  
Statistics – use of  
fertiliser and manure  
by district

LITHUANIA, no regional data

ESTONIA, no regional data





## DAISY modelling

The DAISY model will be run for all combinations of physiographic drivers and management strategies and for 11 different crops – ca. 12000 combinations

From this data set of discrete values a continuous N loss function will be developed using multivariate statistics

The N loss function will be of the type:

N-leaching =

$\text{EXP}(\text{precipitation})^a \cdot [b \cdot \text{Temp}]^c \cdot [c \cdot \text{N-level}]^d \cdot [d \cdot \text{N-manure}]^e \cdot [e \cdot \text{clay}]^f$  (weight for crop)<sup>crop</sup>

- where a, b, c, d, e are parameter estimates



# Up-scaling

- › **to use the N-leaching function with input data for all 10 x 10 km grids**
- › **summarize N-leaching and effect of measures at grid level**
- › **Use difference between root zone leaching and riverine N transport as groundwater N-retention**