Nitrate leaching risks in intensive livestock regions in Europe

André Pflimlin, French Livestock Insitute

4 projects on this topic during 2002 – 2004 :

- Study about the Nitrate directive implementation in 8 countries
- European workshop on Nutrient management in dairy farming
- Interreg Atlantic Area project : Green Dairy with 5 countries
- Statistical analyse on agronomic indicators and nitrate in water (France)

I - Implementation of the Nitrate Directive

in 2002 – 2003 in 8 member states and 12 dairy regions

How to estimate the risk for nitrate leaching

→ Mapping some common indicators

1. Load of N animal manure / ha AA
2. Calculation of nitrogen surplus / ha AA
3. Estimation of the sensitivity to leaching
4. Mapping the nitrate content in ground and surface water

I - Implementation of the Nitrate Directive

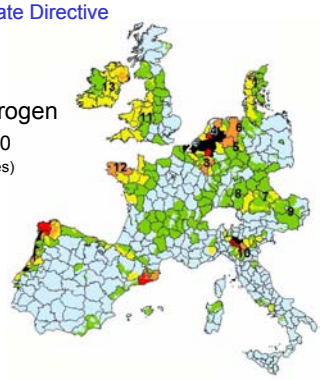
Animal Manure Nitrogen

per ha AA in 2000

(french animal refrences)

N (mg/) / ha AA

- >= 210
- 170-210
- 130-170
- 90-130
- 50-90
- 0-50



Source : Eurostat 2000

I - Implementation of the Nitrate Directive

Nitrogen surplus

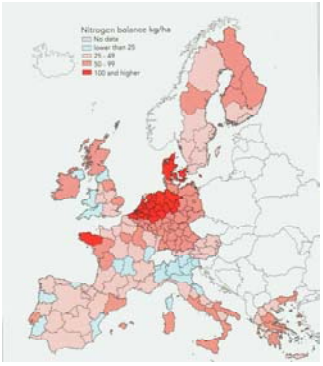
(1977)

Inputs : mineral N + animal N

Outputs : Forage and crop export

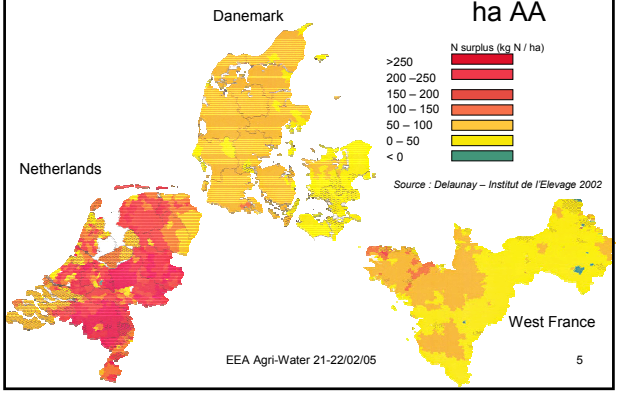
Source : Eurostat / EEA

Questions : Ireland, Italy, Greece



I - Implementation of the Nitrate Directive

Nitrogen surplus / ha AA

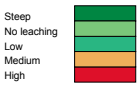


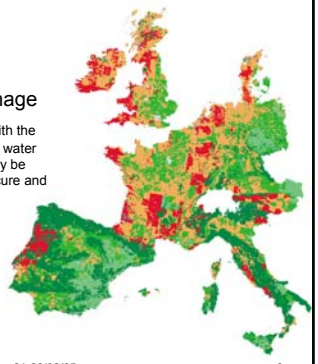
Source : Delaunay – Institut de l'Elevage 2002

I - Implementation of the Nitrate Directive

Sensitivity to winter drainage

Sensitivity to leaching is estimated with the Burns model (1975) in which drained water play a major role. This model can only be used in soils where drainage can occure and with little slope

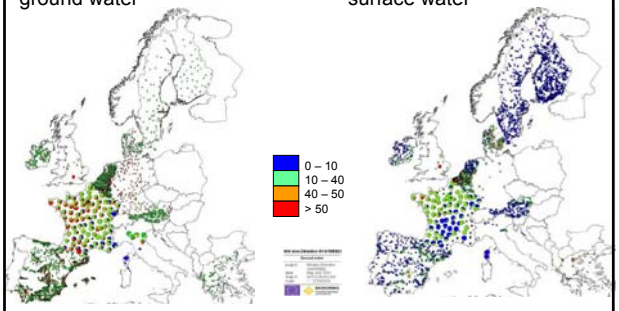




Source : Alterra – Institut de l'Elevage

I - Implementation of the Nitrate Directive

✓Average Nitrate content in ground water surface water



I - Implementation of the Nitrate Directive

✓Still many questions :

- × No common references par animal type ?
- Ammonia losses ? In stable and storage ? (10 → 50)
- × N surplus calculations : common rules ?
- × Sensitivity to leaching : more work needed : what about run off, denitrification …
- × Nitrate content in ground and surface water : spatial distribution, frequency …
- × Common data base available ?

II - European workshop - Quimper France 2003
Nutrient management in intensive dairy farming

Organisers : PRI Wageningen, INRA, Institut de l'Élevage

8 countries : Be, Dk, De, Fr, It, Ire, NL, UK

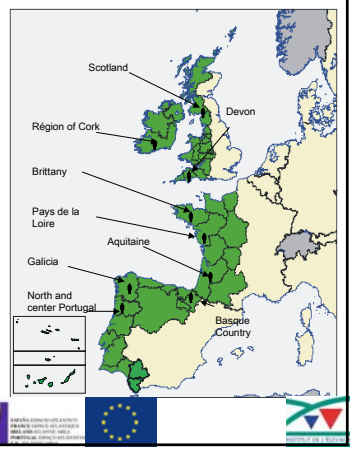
- A large diversity in climate and soils environment
- A will range of milk productions and N surplus / ha
- A wide range of management practices

It's the combinaton of the 3 aspects which can create or solve the environmental problems

III - Green Dairy
An interreg project
2003 - 2006

4 keys actions :

- 9 experimental farms
- 9 groups of pilot farms
- Modelling and maping
- Exchange and transfert



II - European workshop
Intensive dairy farming

3 factors and levels of risks for nitrate leaching

Group of regions	Climate soil (Mountain / slope)	Milk / ha (Rock / size)	Risky practices (Ropes)	NO3 / L in water
Flander (Be) SE / NL	High	High	High	+50
Brittany (Fr) DK	High	Moderate	High	30 - 50
W / Eng SW / Ire	Moderate	High	Moderate	20 - 40

III - Green Dairy - 2005
Analysing and Mapping the risk factors and progress margins on the Green Dairy regions

- Animal N loads / Mineral N / ha AA
- N surplus / ha
- Winter drainage, run off, denitrification …
- Nitrates content in water at different levels

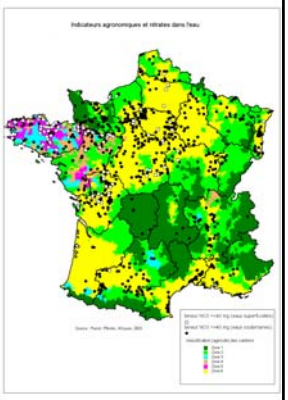
(local → regions)

IV – Agro-environment indicators and Nitrate pollution in water (France) (Provisional)

Z1 : Perm.Grass, beef, dairy
Z2 : Crop + Perm. Grass, dairy + beef
Z3 : Fo. Crop maize dairy
Z4 : Fo. Crop grazing maize dairy
Z5 : Fo. Crop dairy + pigs
Z6 : Crops

>40 mg NO3 surface water
>40 mg NO3 ground water

Census 2000 datas



IV – Agro-environment indicators and Nitrate pollution in water (France) (Provisional)

zones	Perm. Grass. / ha AA	N surplus / ha AA	Winter drainage mm	NO3 mg ground water
Z1	70	10	310	9 4-25
Z2	40	28	280	20 9-31
Z3	21	54	390	40 28-53
Z4	20	37	270	46 35-64
Z5	11	84	390	45 35-68
Z6	9	25	220	32 18-46