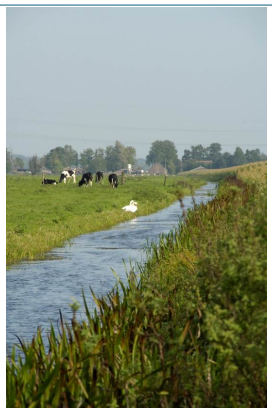
Nitrogen surplus key factor in relation between farm practices and water quality

June 29, 2016 Marga Hoogeveen

Overview

- Minerals policy
- The Minerals Policy Monitoring Programme
- Calculation nitrogen surplus
- Results
- Conclusions



Minerals policy in the Netherlands

- EU-Nitrate directive (170 kg N/ha)
- Derogation NL

-> Period – 1998: manure bookkeeping system

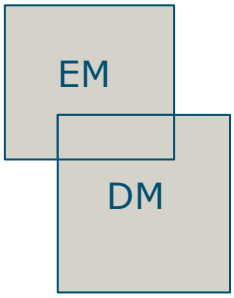
-> Period 1998 – 2005: nutrient loss standards

-> Period 2006 - : application standards

The Minerals Policy Monitoring Programme

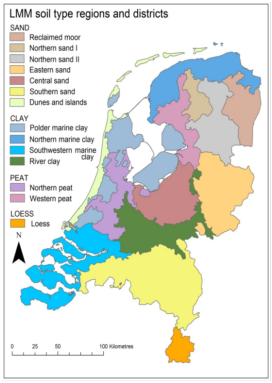
Objectives:

- monitoring the water quality on farms and explaining the results in relation to agricultural practice on those farms (Evaluation Monitor)
- to meet the monitoring requirements imposed by the EC (Nitrate Directive and derogation decision, Derogation Monitor)



The Minerals Policy Monitoring Programme

- FADN-data network
- Stratification on subregion and size of farms (a-select)
- Represent more than 80% of agricultural land in the Netherlands



Number of farms in LMM (2011)

Sector	Sand	Loess	Clay	Peat	Total
Arable	40	20	30	0	90
Dairy	151	20	55	58	284
Intensive husbandry/	41	10	17	8	76
Other farms with livestock					
Total	232	50	102	66	450

Calculation nitrogen surplus

1. calculate the surplus on the farm gate balance

Surplus = Inputs – Outputs + Stock changes

2. calculate the surplus on the soil balance

Surplus on the farm gate balance

+ net mineralisation of organic substances in the soil

+ nitrogen fixation by leguminous plants

+ atmospheric deposition

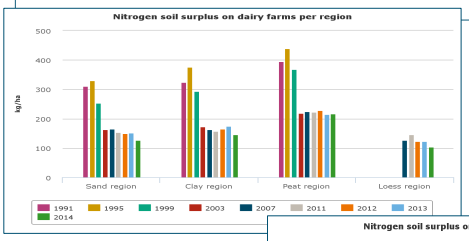
- ammonia emission

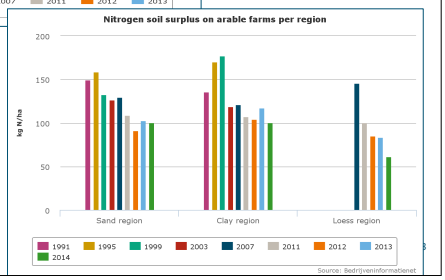
Results: Nitrogen surplus

Nutrient input and output of dairy and arable farms in 2014 (Sand region, kg of nitrogen/ha)

	Dairy		Arable	
	Input	**Output**	**Input**	**Output**
Inorganic fertilizer	113		87	
Organic fertilizer	8	56	127	1
Feedstuffs	195		3	
Animals	1	13		
Plant products	1	31	4	142
Animal products		85		
Total input / total output	318	185	221	143
Surplus on farm gate balance	**133**		**78**	
Mineralisation, deposition and fixation	38		32	
Volatilisation		45		9
Surplus on the soil surface balance	**126**		**101**	

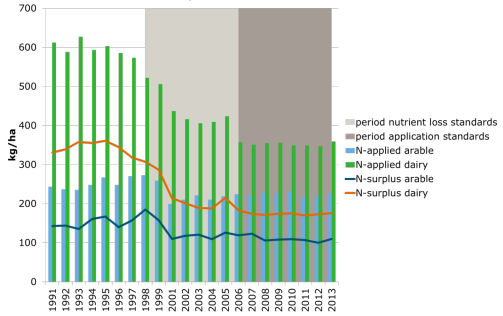
Results: Nitrogen surplus



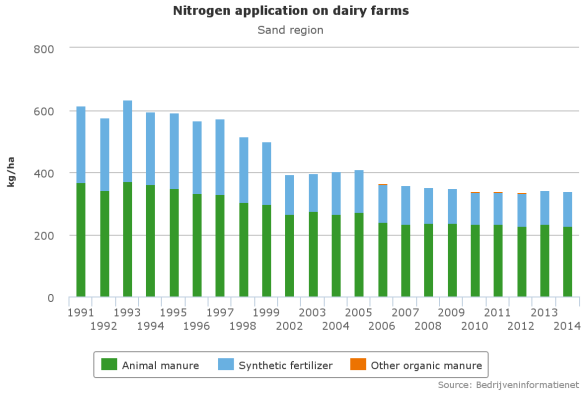


Results: Nitrogen surplus and nitrogen policy

Nitrogen applied (kg/ha) and Nitrogen surplus (kg/ha) for Dutch dairy and arable farms in the 1991-2013 period



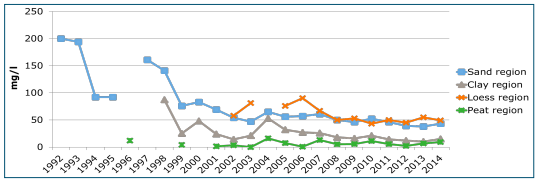
Results Nitrogen application



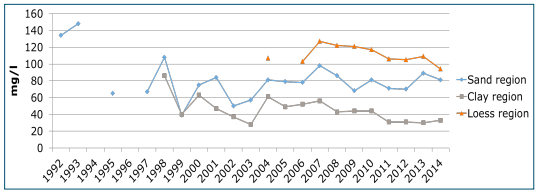
Results: Nitrate concentration

Average nitrate concentration in water leaching from the root zone (ml/l)

Dairy farms:



Arable farms:



Results: Nitrogen surplus and nitrate concentration: leaching fraction

Leaching fractions per soil use and per soil type. Average and 95% confidence level, period 1991-2009

	Sand (well drained)	Clay	Peat
Crops	0.9 (0.82-0.98)	0.34 (0.25-0.43)	-
Grassland	0.44 (0.38-0.50)	0.11 (0.09-0.13)	0.05 (0.04-0.06)

Source: Fraters et al. (2012) Leaching of nitrogen surplus to groundwater and surface waters on farms.

Recalculation of leaching fractions

Conclusions

- Farm management presented by a farm gate and a soil balance method, is effected by the Dutch manure policy. Nitrate concentration in water leaching from the root zone has decreased in the 1992-2014 period.
- N surplus is an indicator for water quality, but the relationship between N surplus and nitrate concentrations differs between farm types and regions.

Thanks for your attention

Acknowledgements:

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