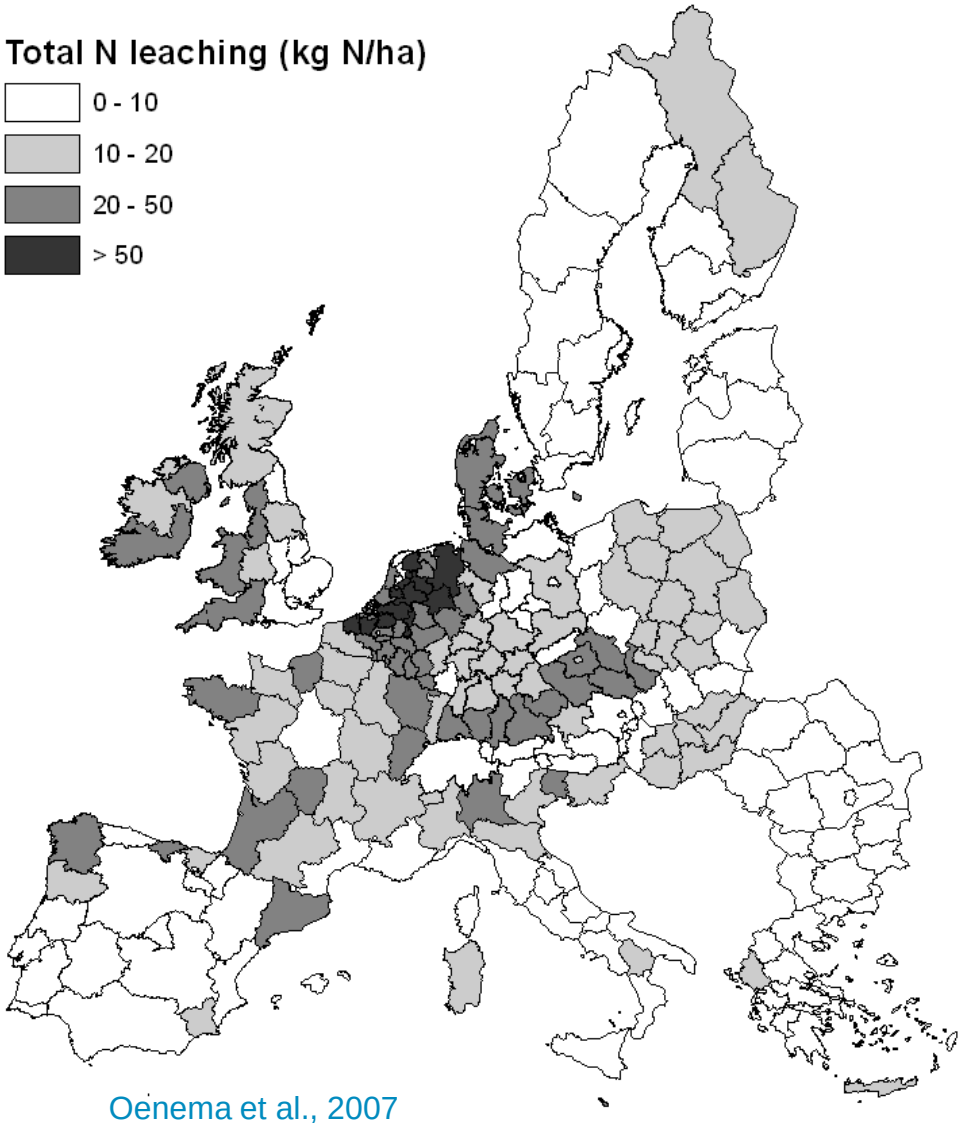
Deltares
Enabling Delta Life

Two monitoring networks in agriculture dominated waters in The Netherlands for assessing the effectiveness of national and European legislation on nutrient and Plant Protection Product application

Joachim Rozemeijer Erwin Roex
Janneke Klein Jasperien de Weert

26 oktober 2015

Introduction



Oenema et al., 2007

Country	Agricultural export (in billions)
United States	118.3 $
Netherlands	79 $
Germany	70.8 $
France	68 $
Brazil	55.4 $

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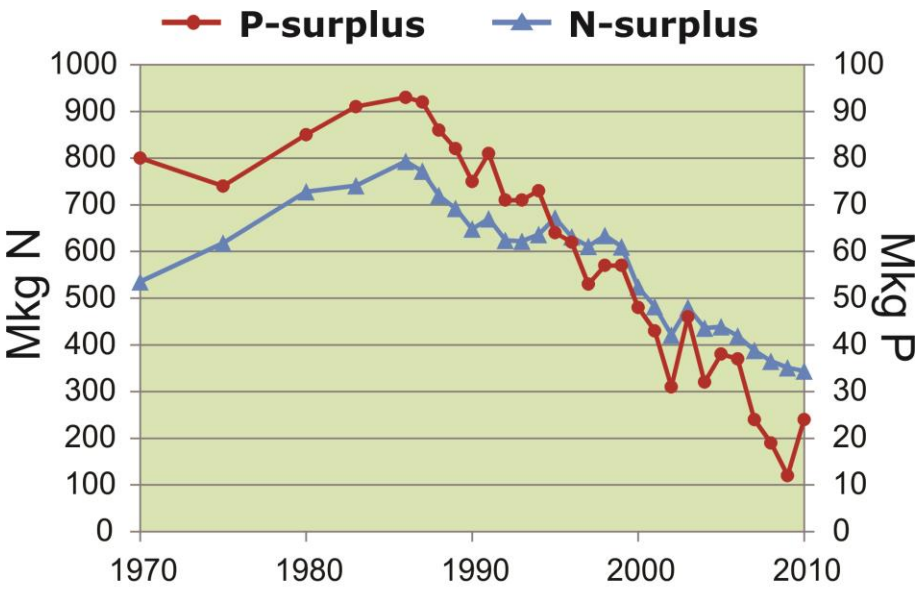
Introduction

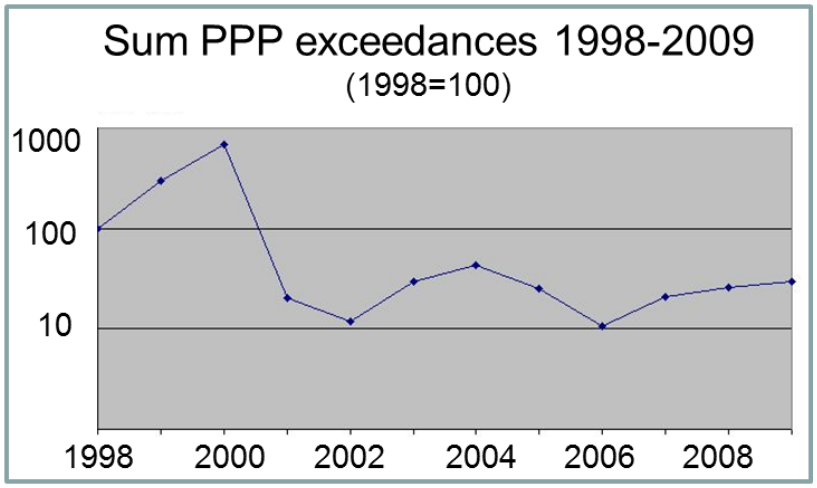
Nutrients

1986: Dutch Manure Law
1991: European Nitrate Directive
2000: Water Framework Directive



Plant protection products

2000: LOTV (and WFD)
2004: Law on sustainable plant protection
2009: EU directives on PPP's
2013: 2nd law on sustainable plant protection
PPP Admission procedures (NL/EU)



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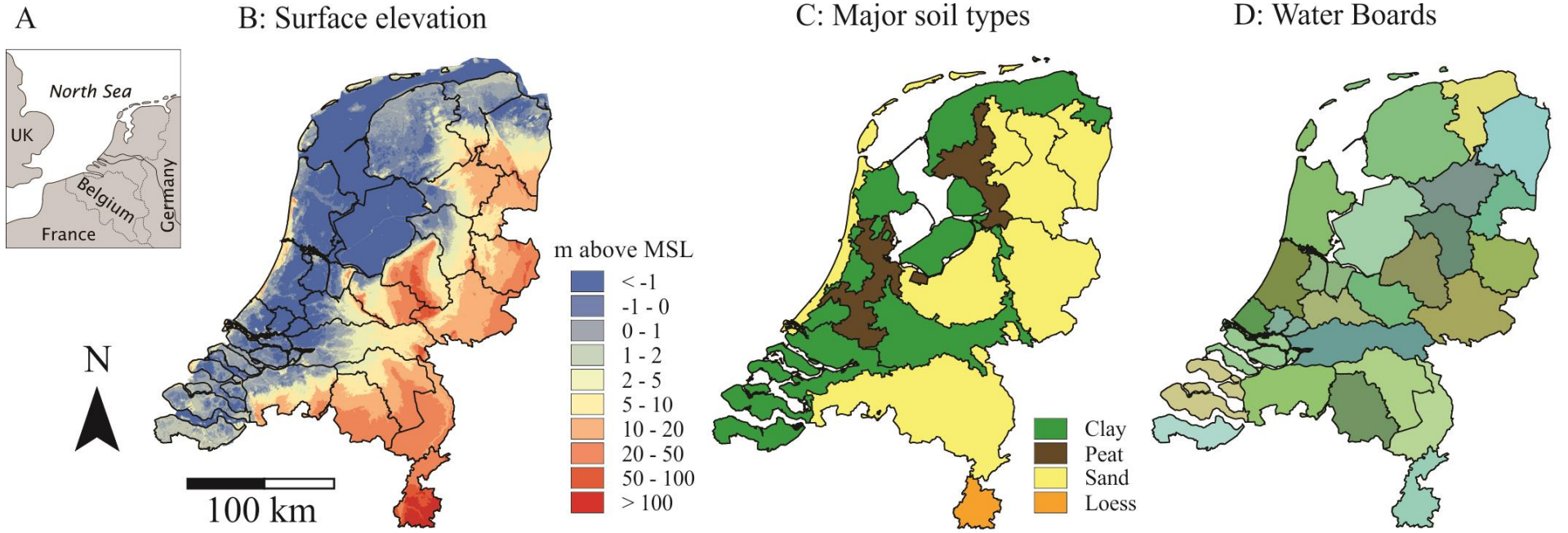
Introduction



Weather

- Precipitation: 500-1100 mm/y
- Evaporation: 200-800 mm/y
- Winter net precipitation +70 mm/month
- Summer net precipitation -20 mm/month

Land use

- 50% non-agricultural land use
- 25% dairy farming (grass+maize)
- 20% arable land (potato, grains, sugar beets, vegetables)
- 5% horticulture

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Presentation setup

- Introduction
- Monitoring networks
- Selection of results
- Conclusions

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Monitoring networks

Nutrients

Nutrient Monitoring Network for Agriculture Specific Headwaters (Dutch: MNLSO)

Goal:

Monitoring based assessment of the water quality in agricultural headwaters:

- Compliance with water quality targets for nutrients
- Trends in nutrient concentrations

Characteristics:

- 173 existing monitoring locations in agriculture specific headwaters, operated by Water Authorities
- 99 trend locations with time series longer than 10 years
- 12 measurements of N-tot and P-tot each year
- First assessments in 2012, update in 2015

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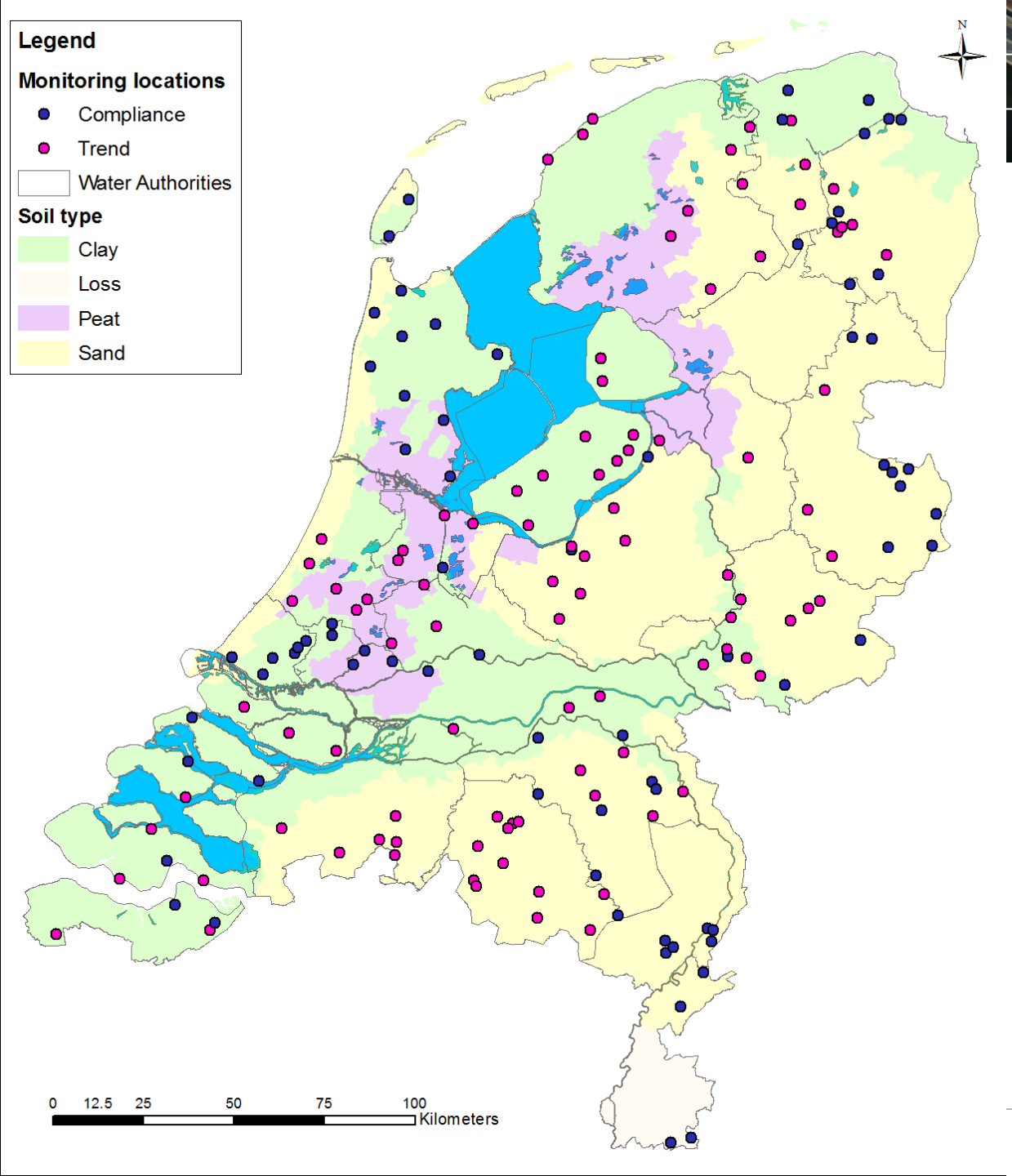
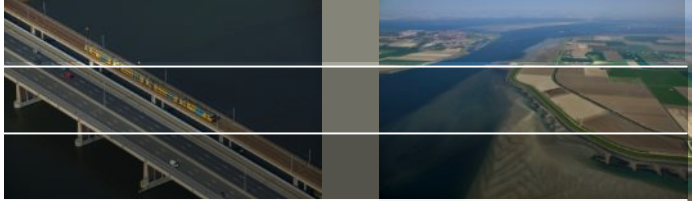

Legend
Monitoring locations
Compliance
Trend
Water Authorities
Soil type
Clay
Loss
Peat
Sand
N
0 12.5 25 50 75 100
Kilometers



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Monitoring networks

Maandag 20 oktober 2014. Het laatste nieuws het eerst op NU.nl

Zoek nieuws

Algemeen / Binnenland

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Datablog

Uitgegeven: 13 juni 2012 14:23
Laatste update: 13 juni 2012 14:35

Deel

Waterkwaliteit landbouwgebieden niet best

DEN HAAG - In de helft van de Nederlandse landbouwgebieden is de waterkwaliteit in sloten en beken onvoldoende.

Dit is te wijten aan bemesting. Het aan banden leggen van mestgebruik sinds 1986 heeft wel tot verbetering geleid, maar verdere maatregelen zijn nodig. Dat concludeert de Unie van Waterschappen woensdag op basis van onderzoek van kennisinstituut Deltares.

Foto: Getty Images

Uit gegevens van 167 meetlocaties blijkt zelfs dat in een ongunstig weerjaar (wanneer het nat is) slechts een kwart van de sloten en beken aan de milieunormen voldoet. Een overschot aan stikstof en fosfor uit dierlijke mest en kunstmest leidt in het oppervlaktewater tot giftige algenbloei, vissterfte en een afnemende biodiversiteit.

beslist.nl

Buitenland

Net binnen

Electrabel DrieJaarVast
Stroom & gas
Drie jaar geen prijsstijgingen
Kosteloos opzegbaar
Electrabel
Bekijk het aanbod

Meest gelezen

platform

Toestand en trends nutriënten in landbouwspecifiek oppervlaktewater

In driekwart van de Nederlandse landbouwgebieden is de waterkwaliteit in sloten en beken onvoldoende en wordt niet voldaan aan de norm voor stikstof of fosfor. Het mestbeleid heeft vanaf 1986 wel voor verbetering gezorgd, maar verdere maatregelen zijn nodig. Deze conclusies zijn gebaseerd op meetgegevens uit het nieuwe Meetnet Nutriënten Landbouw Specifiek Oppervlaktewater (MNLSO).

De intensieve veehouderij in Nederland produceert grote hoeveelheden mest die worden verspreid op akkers en weilanden. Het gebruik van deze dierlijke mest, nog aangevuld met kunstmest, zorgt voor te veel stikstof en fosfor in bodem, grondwater en oppervlaktewater. De Nederlandse regering heeft daarom in 1986 de Meststoffenwet ingevoerd. Elke vijf jaar wordt het effect van de emissiebeperkende maatregelen uit de Meststoffenwet geëvalueerd.

Dit jaar is er een nieuwe evaluatie van de Meststoffenwet, de EMW2012. Voor deze evaluatie heeft Deltares samen met de waterschappen en het ministerie van Infrastructuur en Milieu een meetnet opgezet voor landbouwspecifiek oppervlaktewater. Het Meetnet Nutriënten Landbouw Specifiek Oppervlaktewater (MNLSO) is samengesteld uit bestaande meetlocaties van de waterschapsmeetnetten voor waterkwaliteit. In samenwerking met de 25 waterschappen is een selectie gemaakt van meetlocaties waar landbouw de enige niet-natuurlijke bron van nutriënten is. De meetgegevens uit het MNLSO zijn gebruikt om vast te stellen of de waterkwaliteitsdoelen met betrekking tot nutriënten worden gehaald in landbouw-specifiek oppervlaktewater en of er dalende of stijgende trends zijn in de nutriëntenconcentraties.

Resultaten

In totaal zijn 167 meetlocaties geselecteerd voor het MNLSO, waarvan er 87 geschikt zijn voor trendanalyse doordat ze minimaal

Afb. 1: Normoverschrijdingen in 2007 t/m 2010 voor de combinatie van N-totaal en P-totaal, getoetst aan de norm die de waterschappen hanteren. Het vakje is alleen groen als zowel N-totaal als P-totaal aan de norm voldoet. Voor elke locatie wordt voor vier jaren het toetsingsresultaat weergegeven (linksboven: 2007, rechtsboven: 2008, linksonder: 2009, rechtsonder: 2010).

Environ Monit Assess
DOI 10.1007/s10661-014-4059-0

Water quality status and trends in agriculture-dominated headwaters; a national monitoring network for assessing the effectiveness of national and European manure legislation in The Netherlands

J. C. Rozemeijer · J. Klein · H. P. Broers · T. P. van Tol-Leenders · B. van der Grift

Received: 22 October 2013 / Accepted: 11 September 2014

Abstract Large nutrient losses to groundwater and surface waters are a major drawback of the highly productive agricultural sector in The Netherlands. The resulting high nutrient concentrations in water resources threaten their ecological, industrial, and recreational functions. To mitigate eutrophication problems, legislation on nutrient application in agriculture was enforced in 1986 in The Netherlands. The objective of this study was to agricultural headwaters. Trend analysis for these locations showed a fast reduction of nutrient concentrations after the enforcement of the manure legislation (median slopes of −0.55 mg/l per decade for total nitrogen (N-tot) and −0.020 mg/l per decade for total phosphorus (P-tot)). Still, up to 76 % of the selected locations currently do not comply with either the environmental quality standards (EQSs) for nitrogen (N-tot) or phosphorus

European Commission

Science for Environment Policy

Nutrient pollution in Dutch streams is falling, but further reductions needed

Nutrient pollution in The Netherlands is falling as a result of national and EU policies, new research has shown. However, many waters still routinely fail to meet environmental quality standards. The study, which focused on the headwaters of 167 rivers where agricultural fertilisers are the main cause of pollution, showed that up to 76% of these did not meet water quality standards.

5 February 2015
Issue 402

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Source: Rozemeijer, J. C. Klein, J., Broers, H. P. *et al.* (2014). Water quality status and trends in agriculture-dominated headwaters; a

Nutrient pollution can have devastating effects on aquatic wildlife, with biodiversity dropping sharply in the face of toxic algal blooms and low levels of dissolved oxygen. Much of this pollution is the result of agricultural fertilisers, with large amounts leaching from fields.

The Netherlands is particularly affected by this issue, as large parts of the country are

Monitoring networks

Plant Protection Products

National Monitoring Network for Plant Protection Products in Agriculture and Horticulture

Goal:

Monitoring based assessment of:

- the relation between PPP use in agriculture and non-compliance in surface water
- the realisation of the reduction in non-compliance (target is 90% in 2023)

Monitoring results will feed back into the PPP admission procedures

Characteristics:

- 98 monitoring locations operated by Water Authorities
- locations represent individual crop types
- 6-12 measurements per year
- Top-24 problem PPP's + crop type specific PPP's
- Start up in 2015

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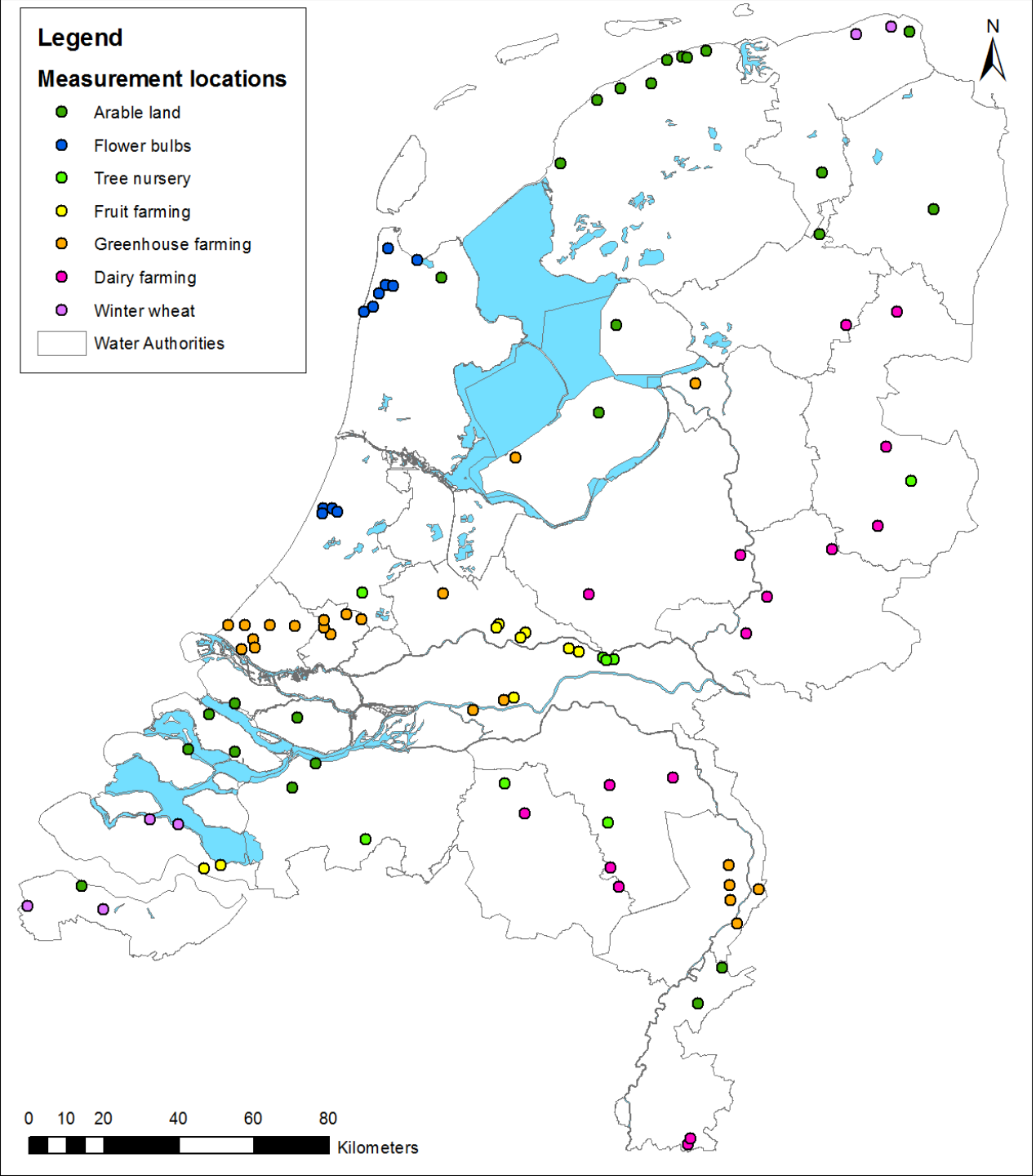

Rank	PP-product
1	terbuthylazine, desethyl-
2	imidacloprid
3	pirimifos-methyl
4	azoxystrobin
5	methiocarb
6	carbendazim
7	abamectine
8	pirimicarb
9	ETU
10	thiacloprid
11	fipronil
12	pyraclostrobin
13	spinosad
14	terbutylazine
15	linuron
16	fenoxycarb
17	thiamethoxam
18	dimethoaat
19	captan
20	teflubenzuron
21	terbutrin
22	thiofanaat-methyl
23	mancozeb
24	maneb

Presentation setup

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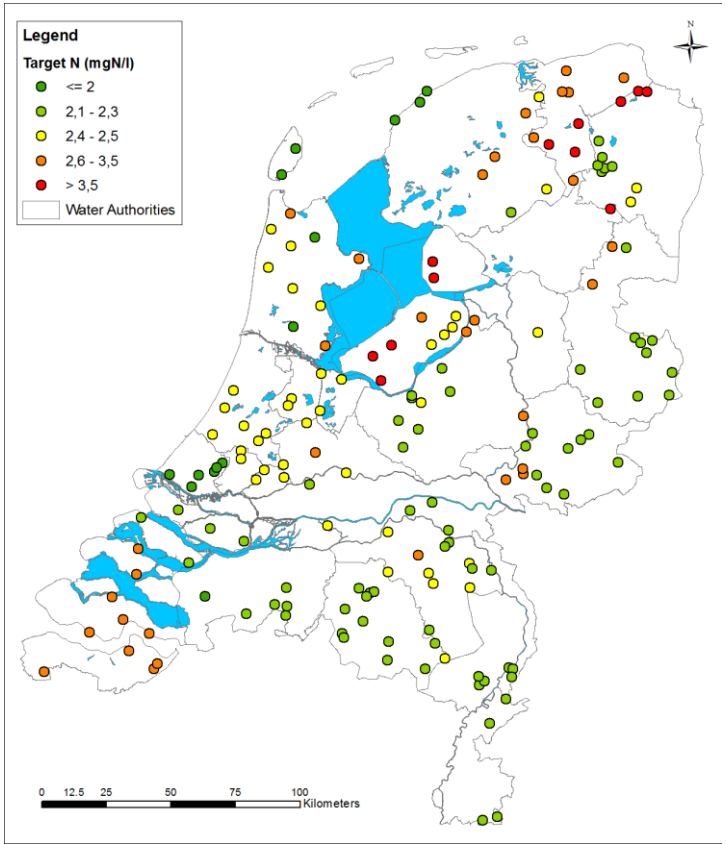
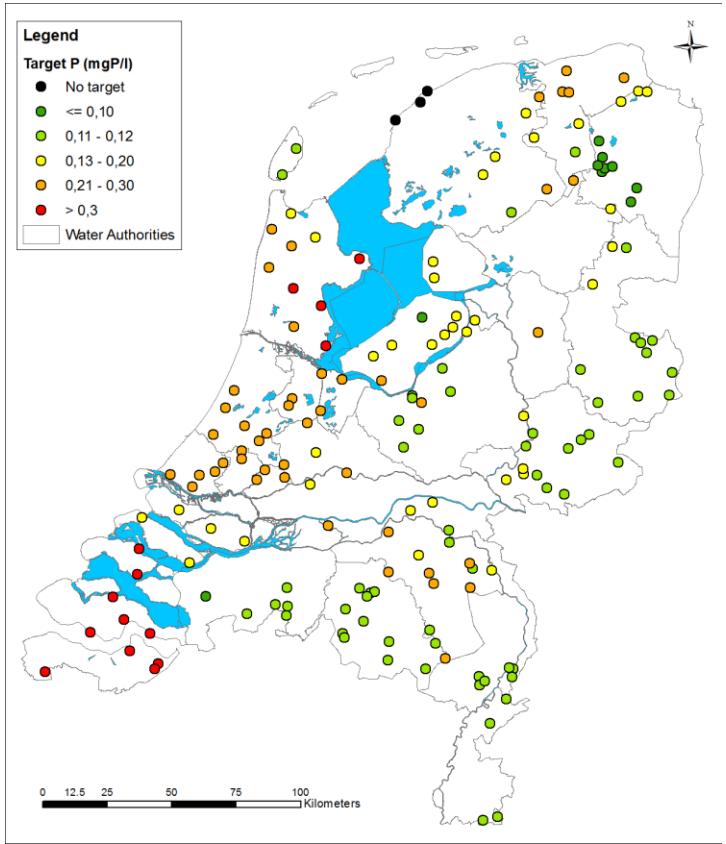
Selection of results

Compliance testing: Is there any problem with nutrient concentrations in agriculture dominated headwaters?

Approach:

- Testing on yearly summer average concentrations
- Region specific water quality targets (set by Water Authorities)





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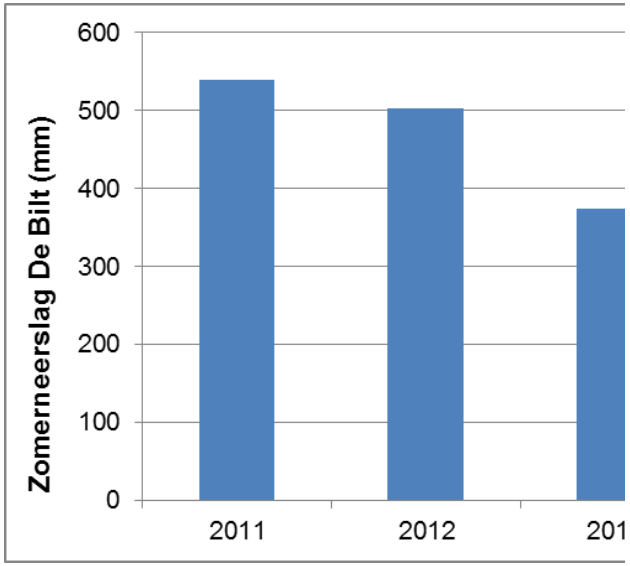
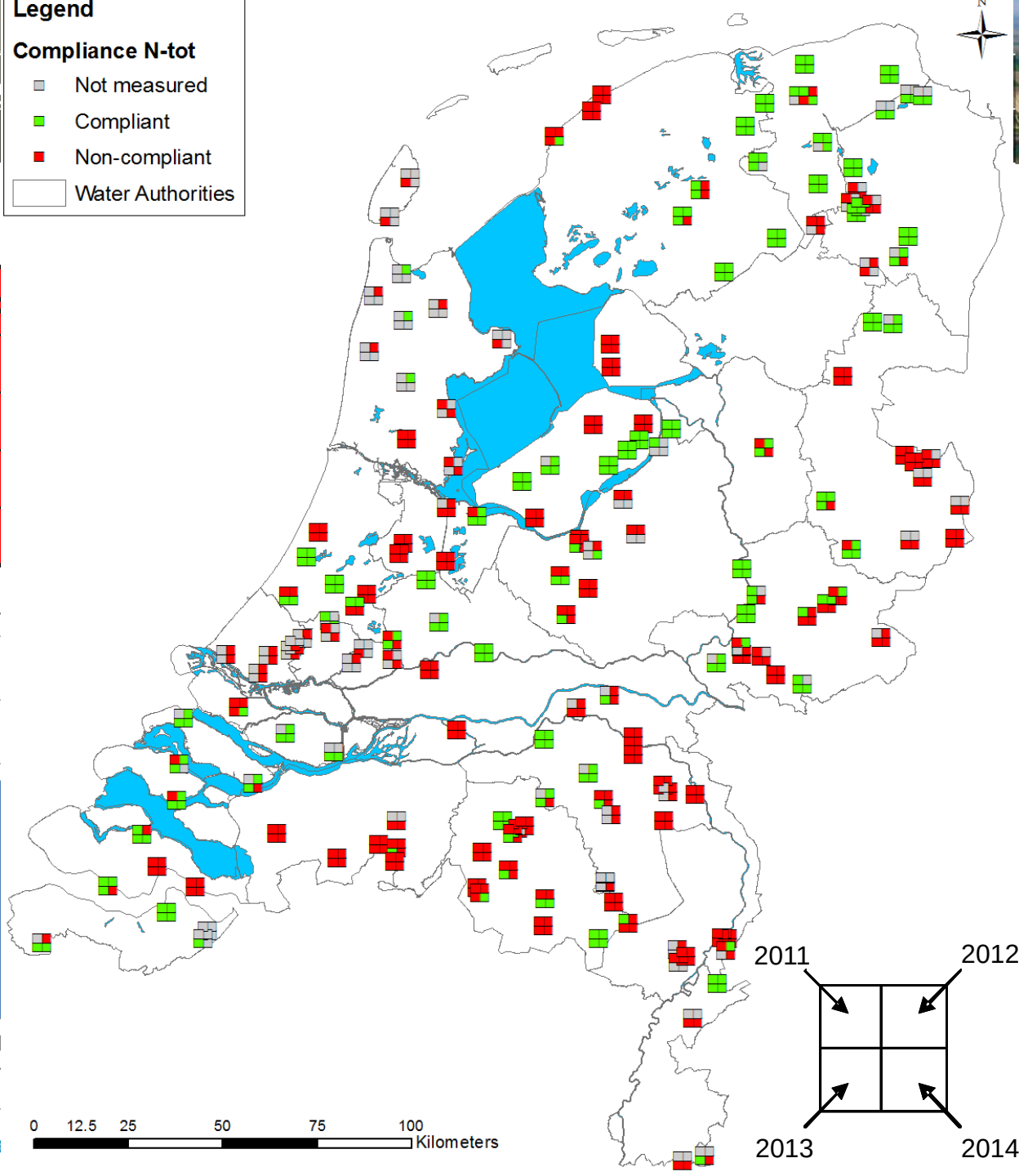
N-tot compliance

Year	Compliant (%)	Non-c
2011	37	
2012	40	
2013	52	
2014	36	

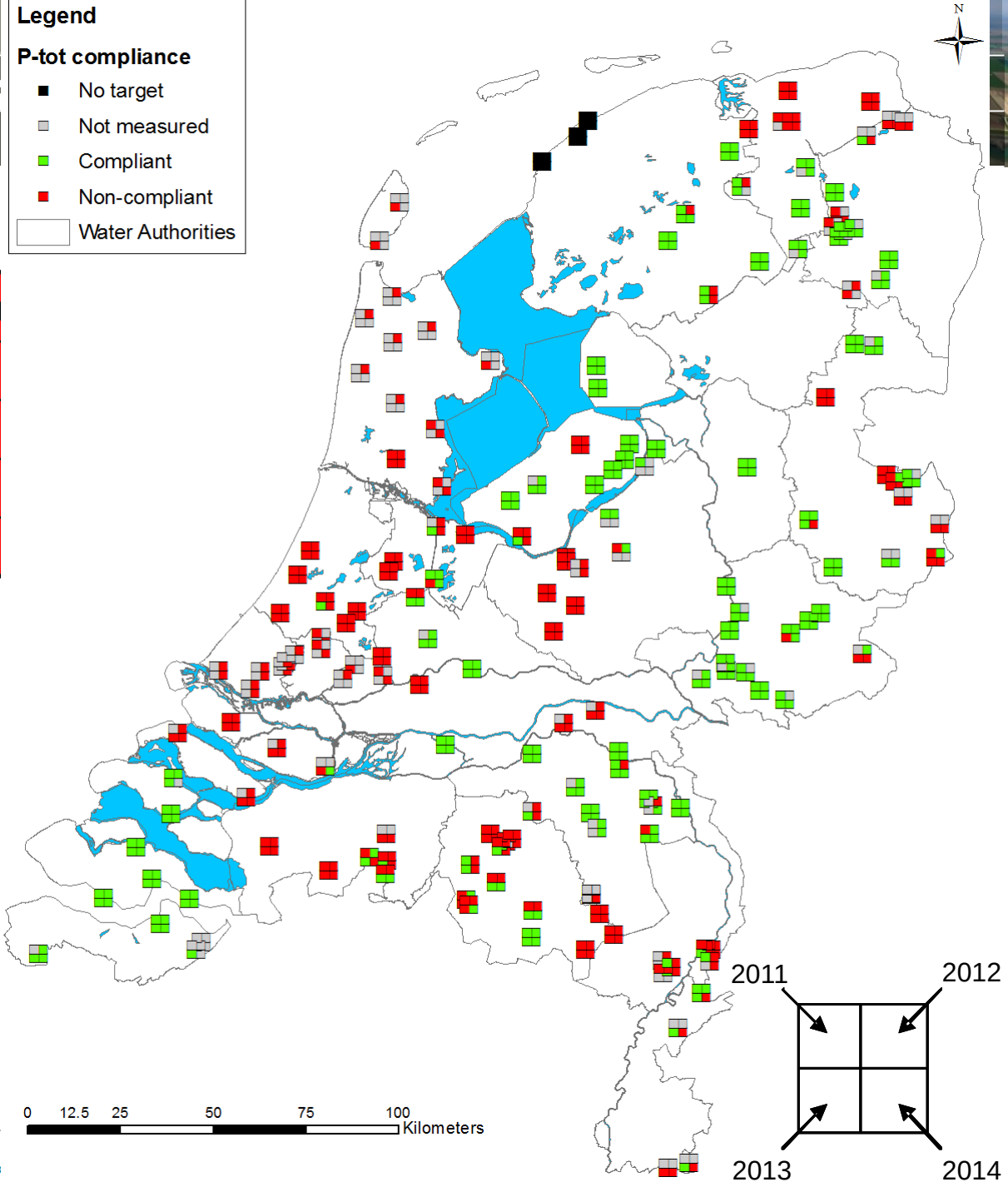




Selection of res

P-tot compliance

Year	Compliant (%)	Non-co
2011	50	
2012	46	
2013	59	
2014	46	

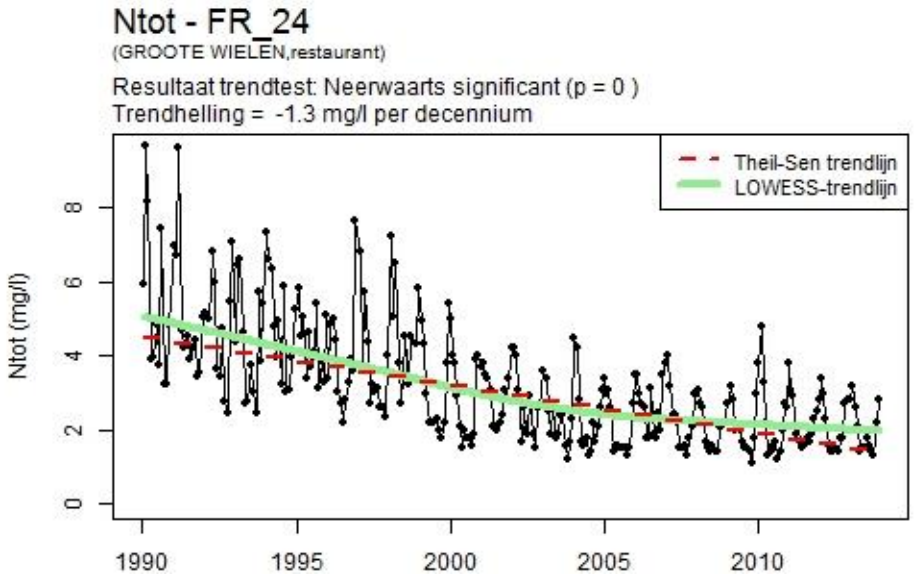


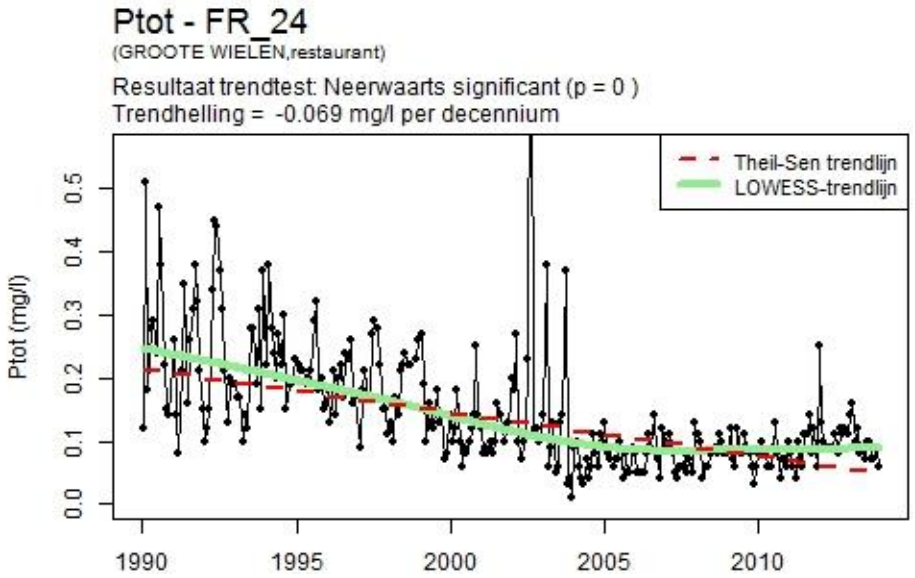
Selection of results

Trend analysis: Are nutrient concentrations in agricultural dominated headwaters decreasing?

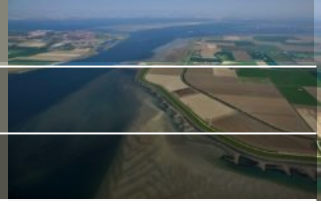
Approach:

- Time series > 10 years
- First trends for each location, then up-scaling by aggregation
- 3 robust, non-parametric analytical methods (Seasonal Mann Kendall trend test, Theil-Sen slope estimator, LOWESS trendlines)





Selection of results



Aggregated trends NL: **Seasonal Mann Kendall trend test**

N- totaal	
Upward (p<0.05)	3
Downward (p<0.05)	82
No significant trend (p>0.05)	14
P-totaal	
Upward (p<0.05)	12
Downward (p<0.05)	54
No significant trend (p>0.05)	33

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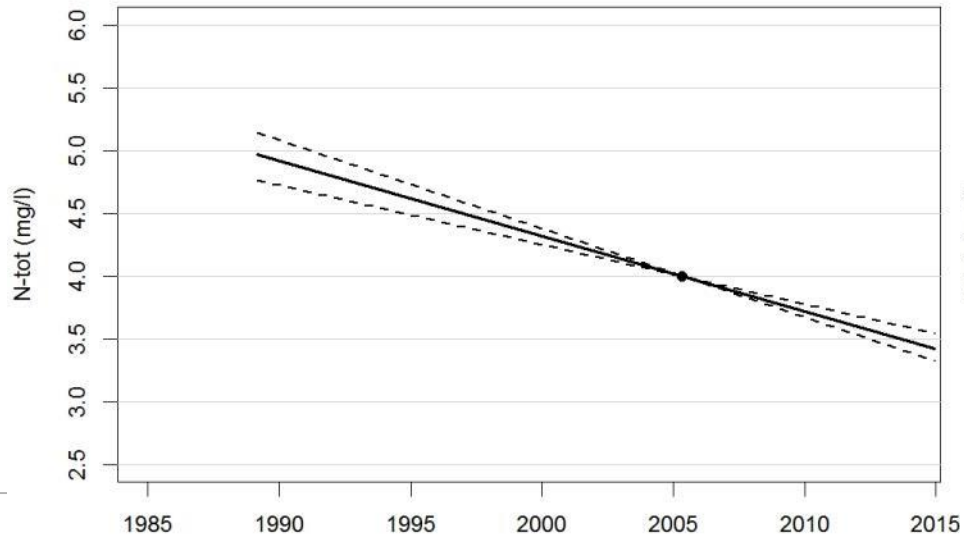
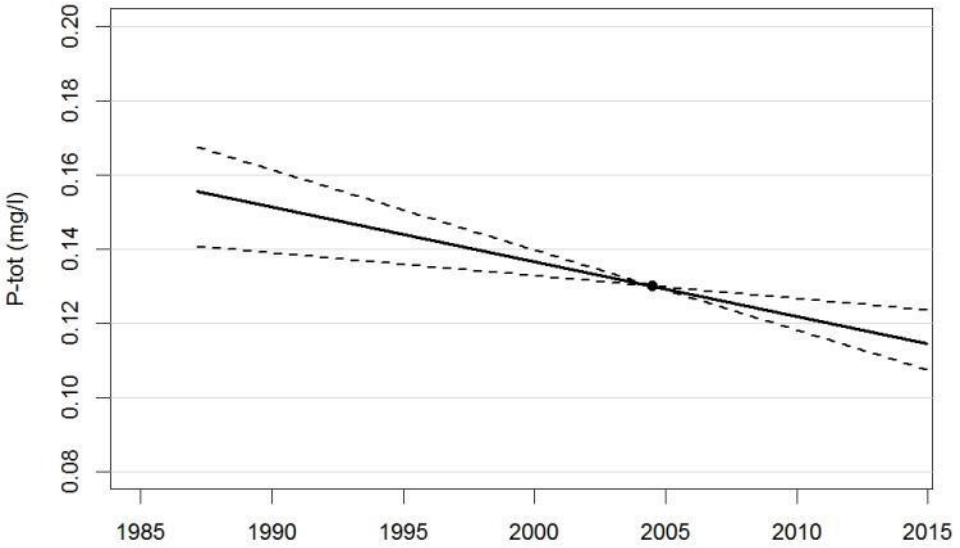
Selection of results

Aggregated trends NL: Sen's slope estimator

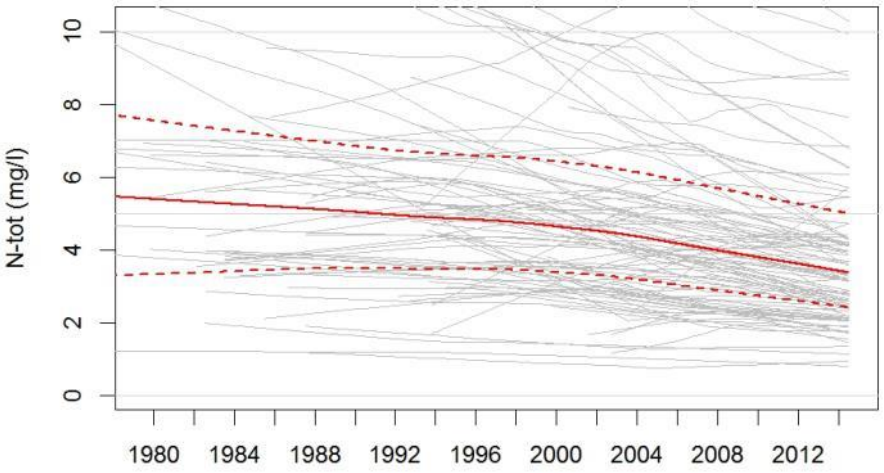
	Median trend (mg/l per decennium)	Lower / upper 95% confidence (mg/l per decennium)	Conclusion
N-totaal	-0.60	-0.70 / -0.47	Downward significant
P-totaal	-0.015	-0.022 / -0.0062	Downward significant

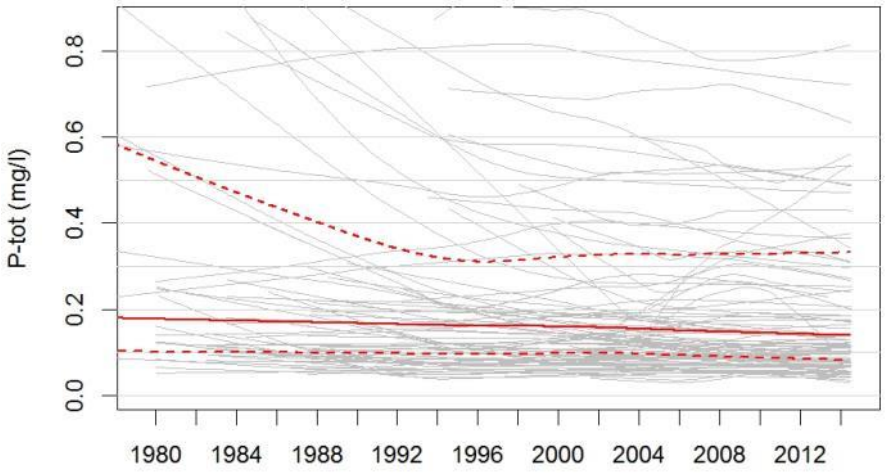




Selection of results

Aggregated trends NL: LOWESS trendline





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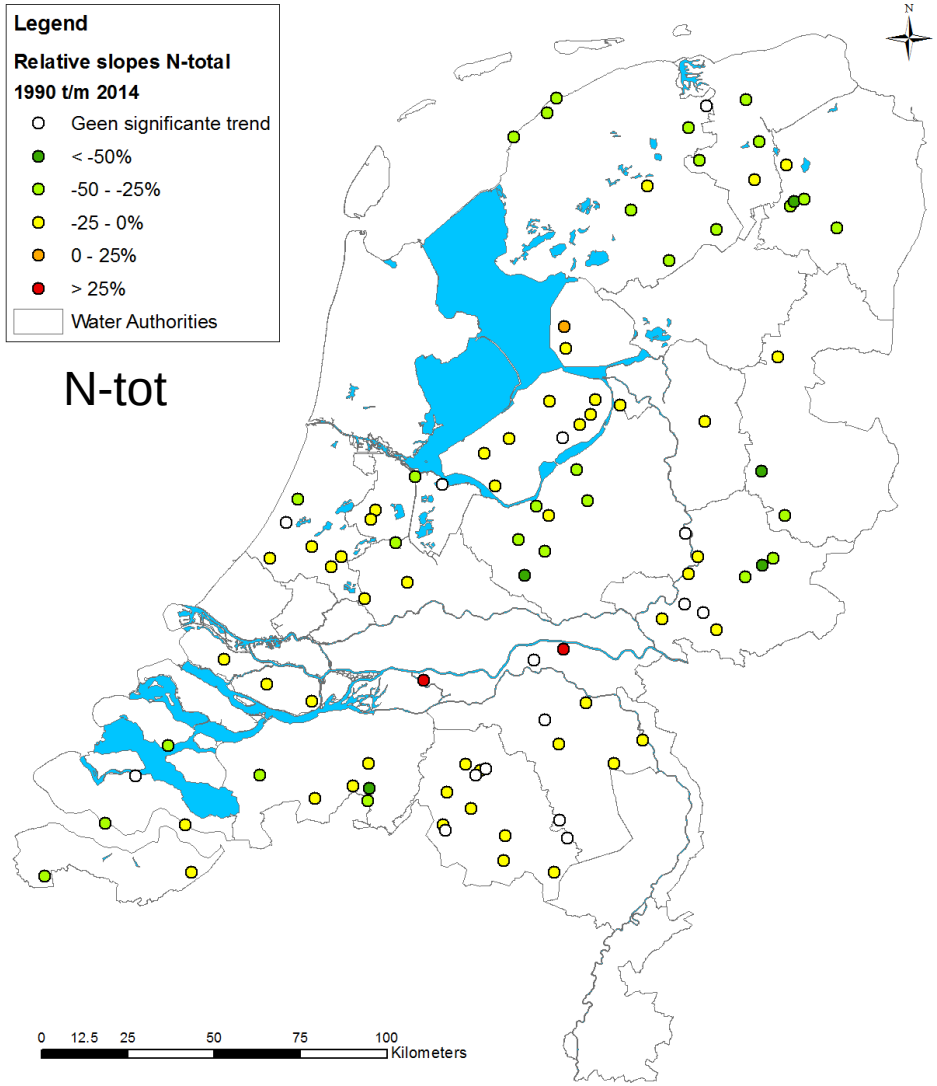
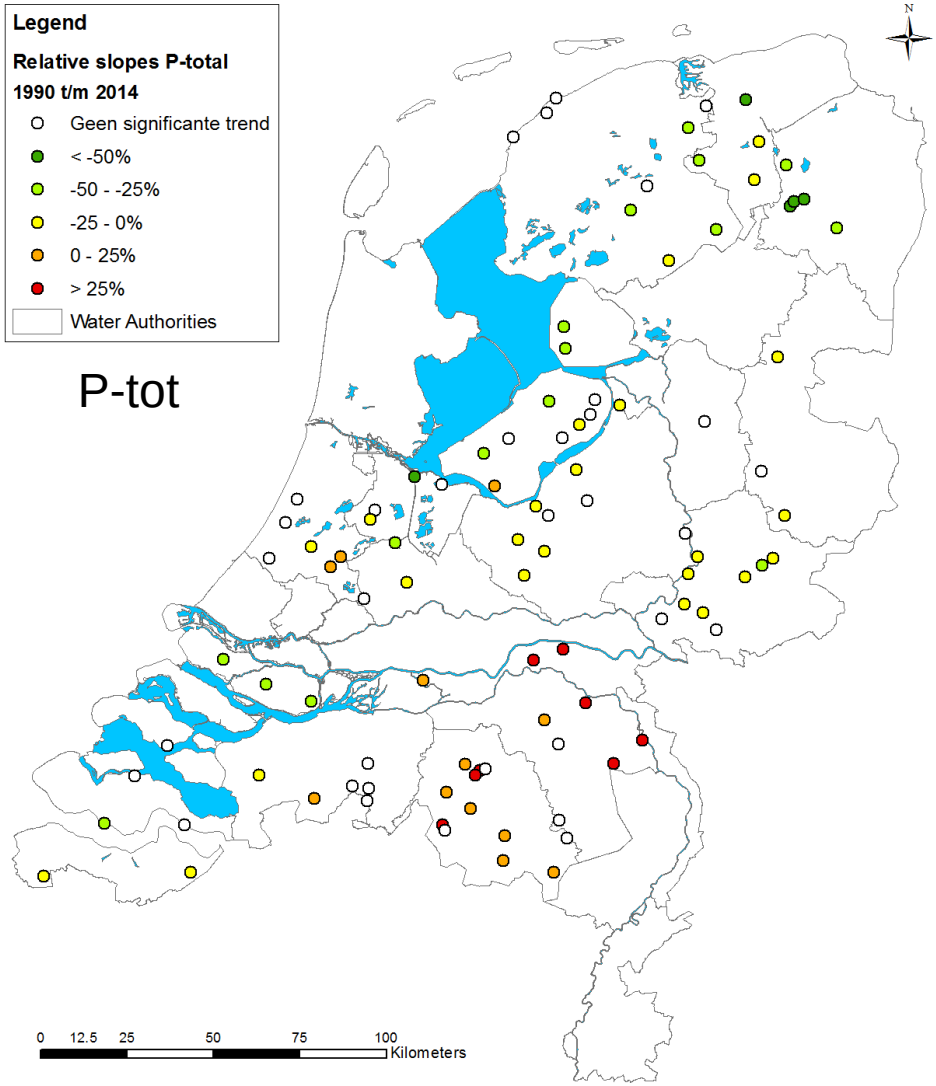
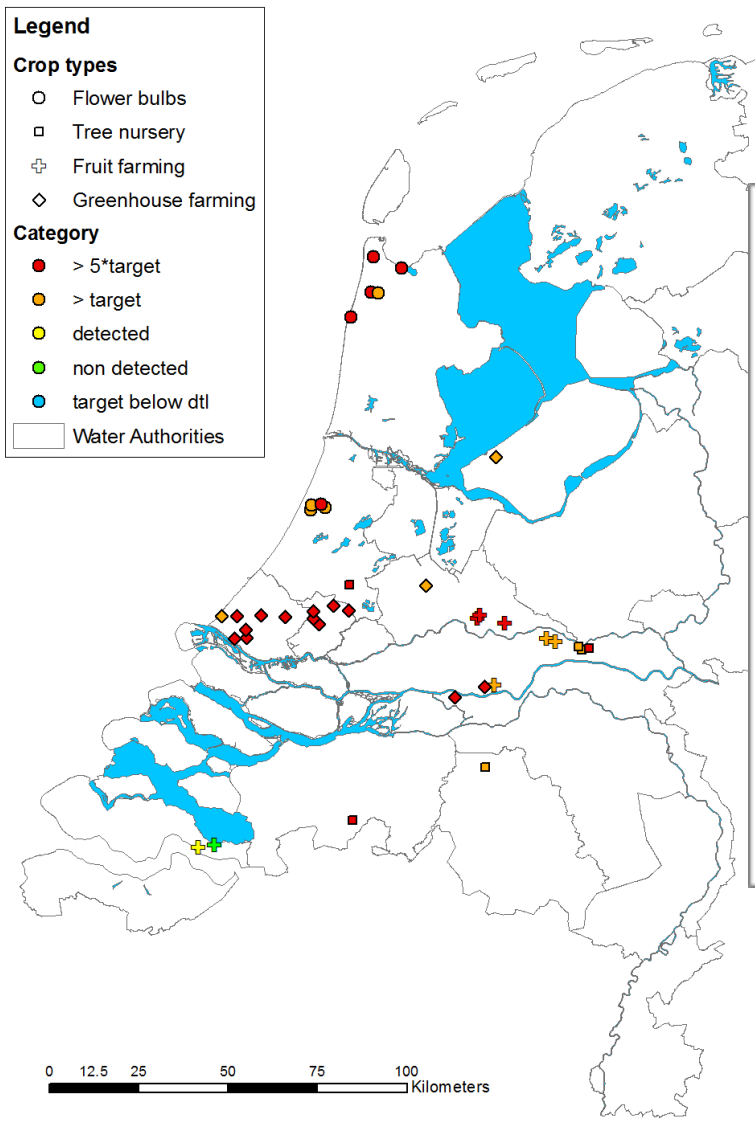
Relative slopes

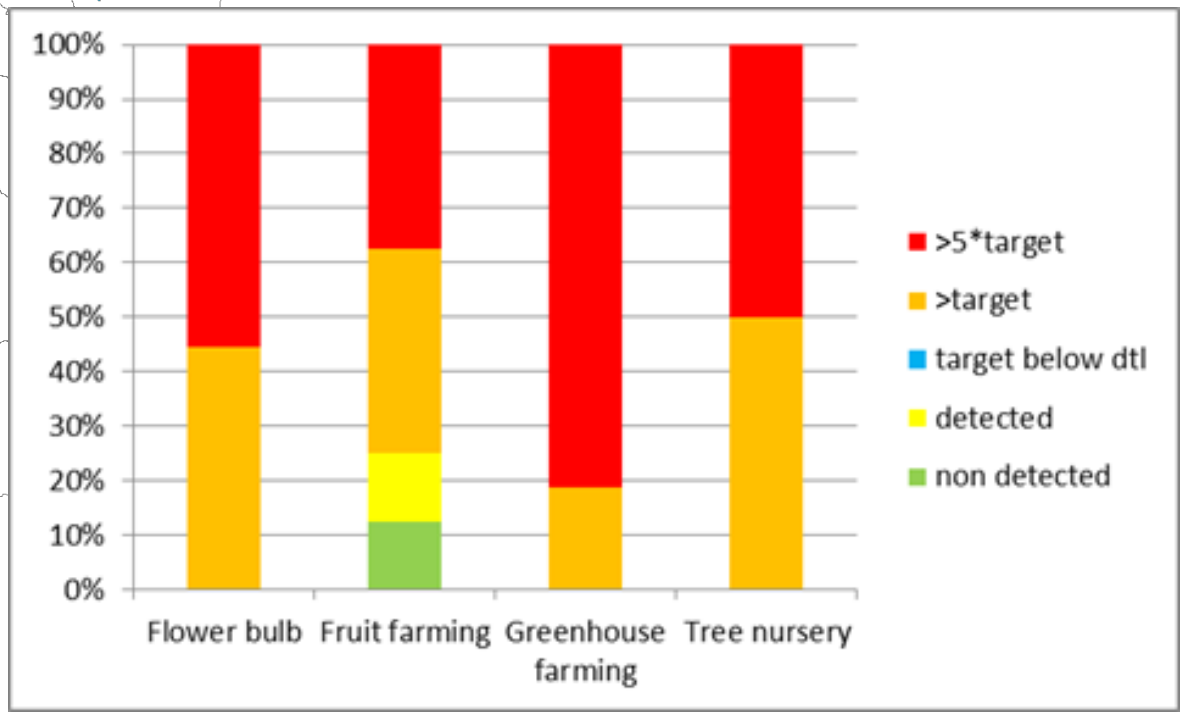




Selection of results

Preview trend results PPP: Imidacloprid





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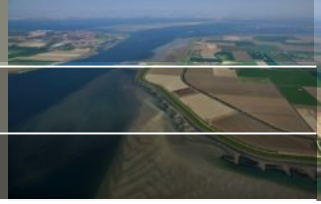
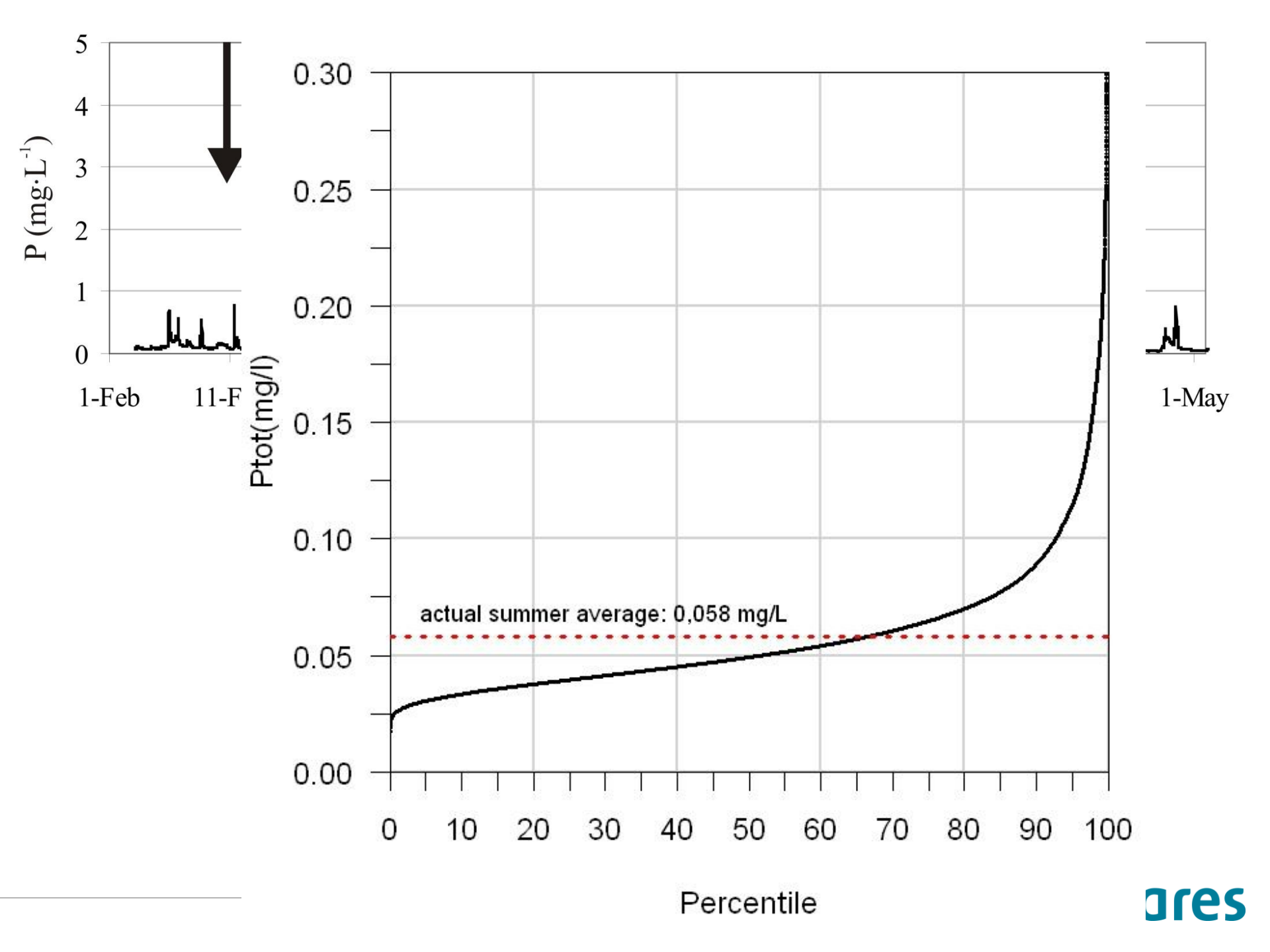
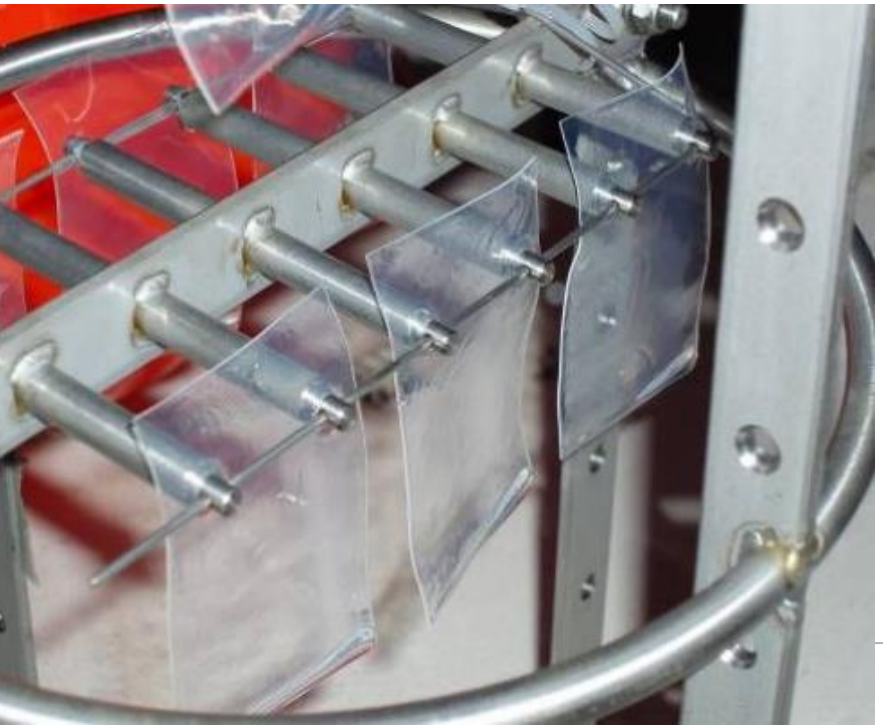
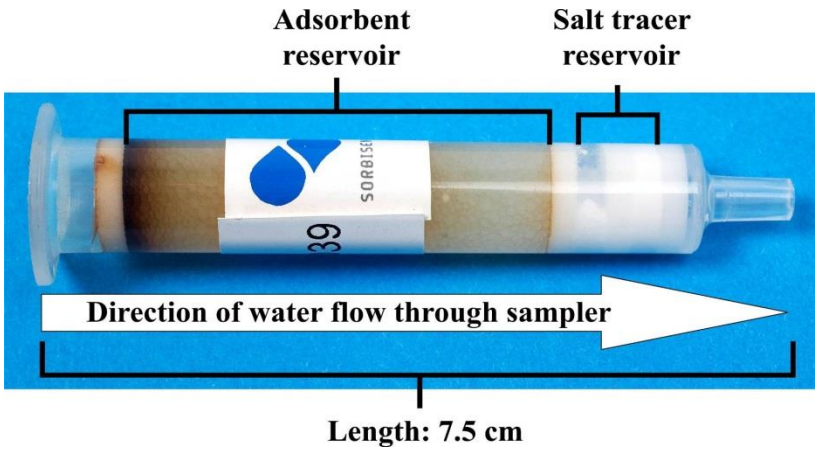
Conclusions



- Nutrient concentrations are reducing, but more action is needed
- Complience testing based on summer average concentrations underestimates the agricultural impact on ecosystem health of downstream water bodies
- A water quality status assessment cannot be based on 1 monitoring year (weather induced variability)
- Complience testing results for individual locations are partly coincidental


P (mg·L-1)
5
4
3
2
1
0
1-Feb
11-F
1-May
Ptot(mg/l)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
actual summer average: 0,058 mg/L
0
10
20
30
40
50
60
70
80
90
100
Percentile




Adsorbent reservoir
Salt tracer reservoir
SORBISE
39
Direction of water flow through sampler
Length: 7.5 cm

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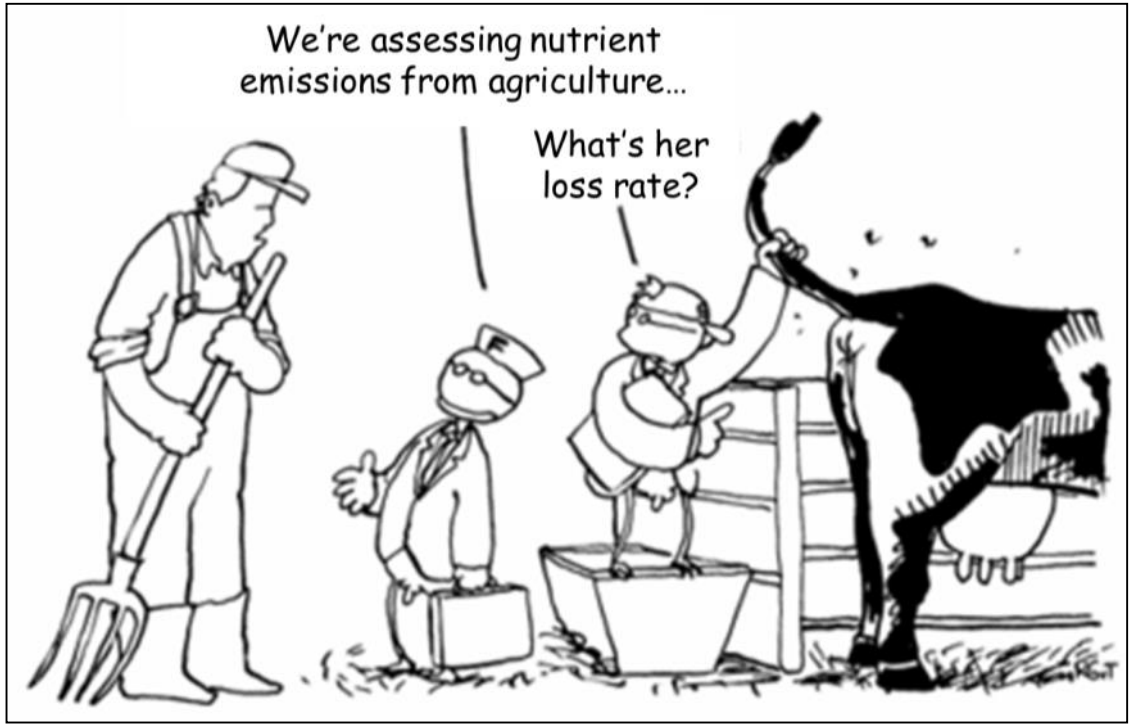
Questions?

Fokke and Sukke have a source oriented research approach…



More info: Rozemeijer et al., 2014. Water quality status and trends in agriculture dominated headwaters. Environmental Monitoring and Assessment 186, 8981-8995.

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