Monitoring of the Environmental Impact of Manure Handling in Animal Farms

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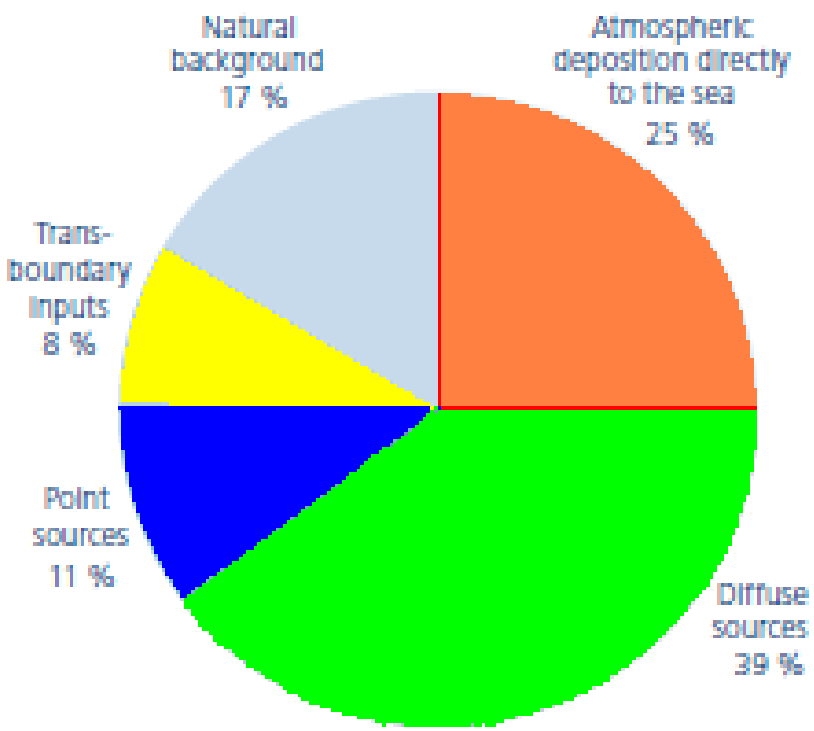
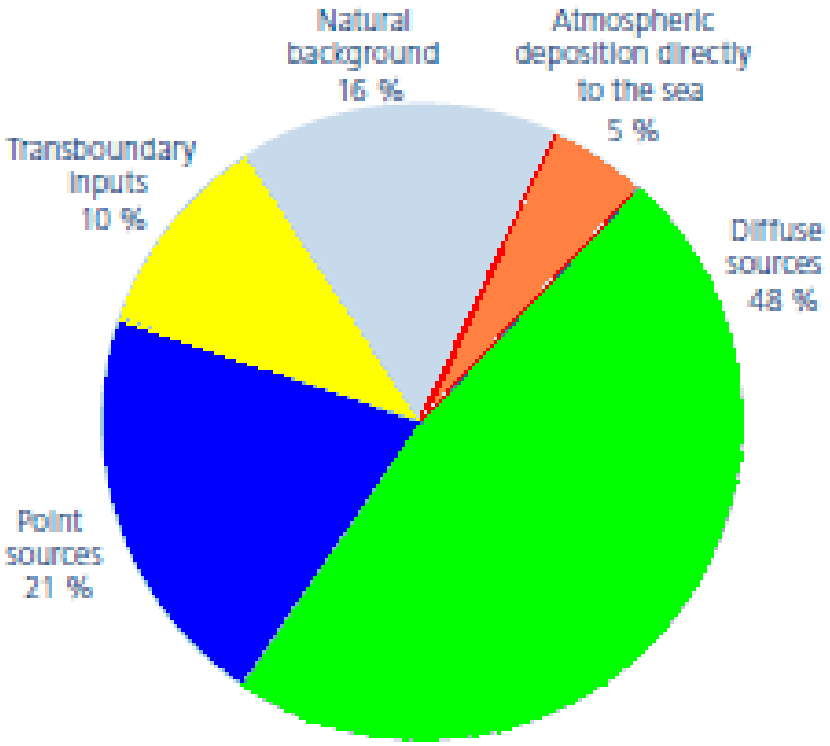
Agriculture contribute 70-90% of N and 60-80% of P non-point pollution load to the Baltic Sea

Source: The Fifth Baltic Sea Pollution Load Compilation (PLC-5). Balt. Sea Environ. Proc. No. 128. 2011.

A Sources of nitrogen inputs to the Baltic Sea



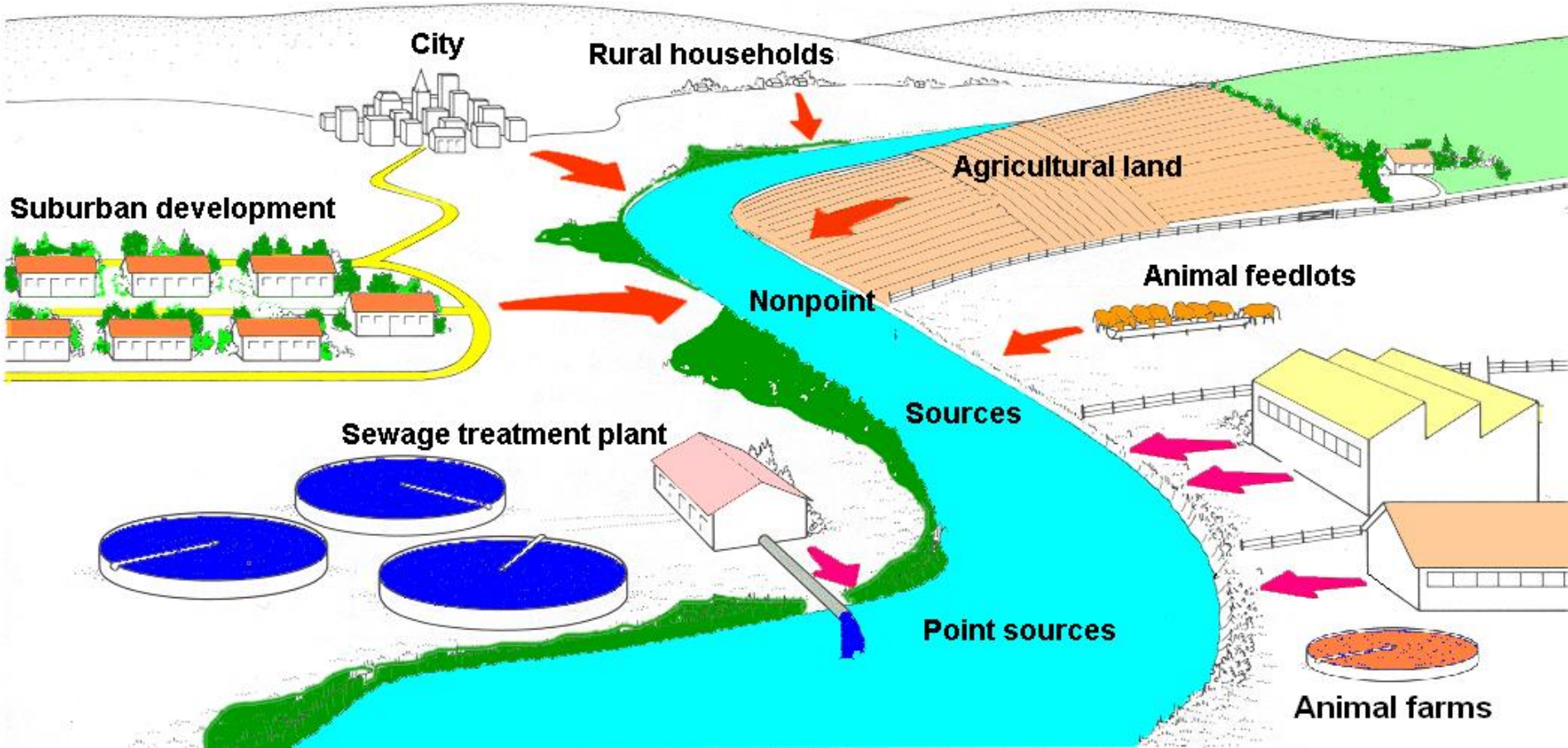
B Sources of phosphorus inputs to the Baltic Sea



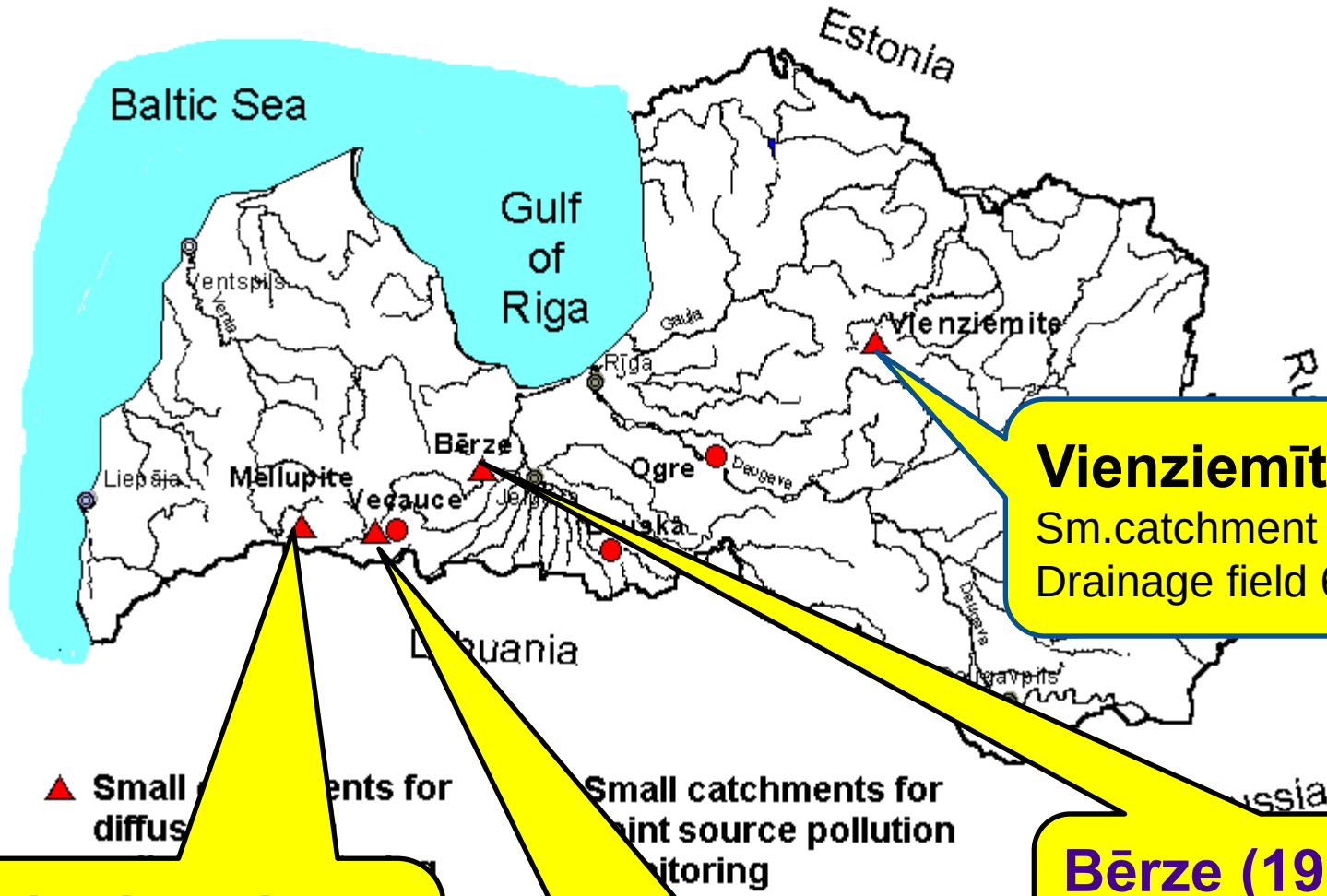
Proportions of different input sources of nitrogen (A) and phosphorus (B) to the Baltic Sea. Point sources include both coastal and inland point sources. Note that transboundary inputs have not been divided into point or diffuse sources. Data source: HELCOM PLC-5.

Water pollution source – agricultural run-off

- Non point sources (surface and drainage run-off)
- Point sources (leakage from storages, feedlots, manure dumping sites)



Non-point agricultural pollution monitoring



Vienziemīte (1994)
Sm.catchment 592 ha
Drainage field 67 ha

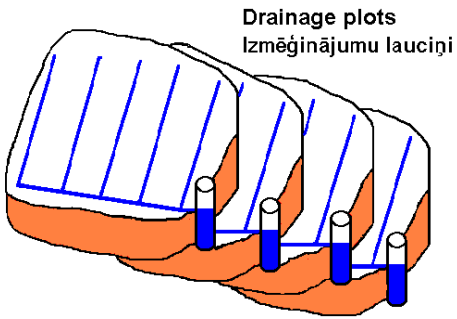
Bērze (1994)
Drainage field 76 ha
Sm.catchment 360 ha

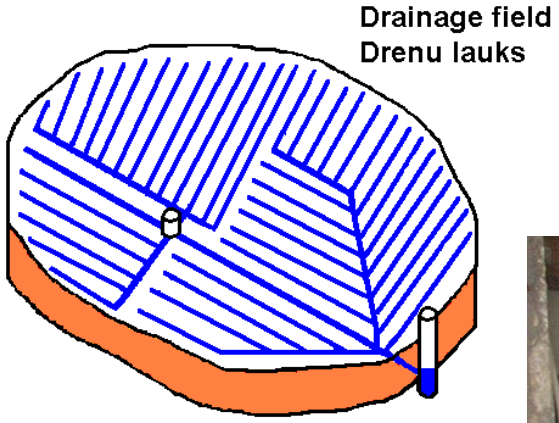
Auce (2014)
Sm.catchment 68 ha

Mellupite (1995)
15 Drainage plots (0.12 ha)
Drainage field 12 ha
Sm.catchment 960 ha

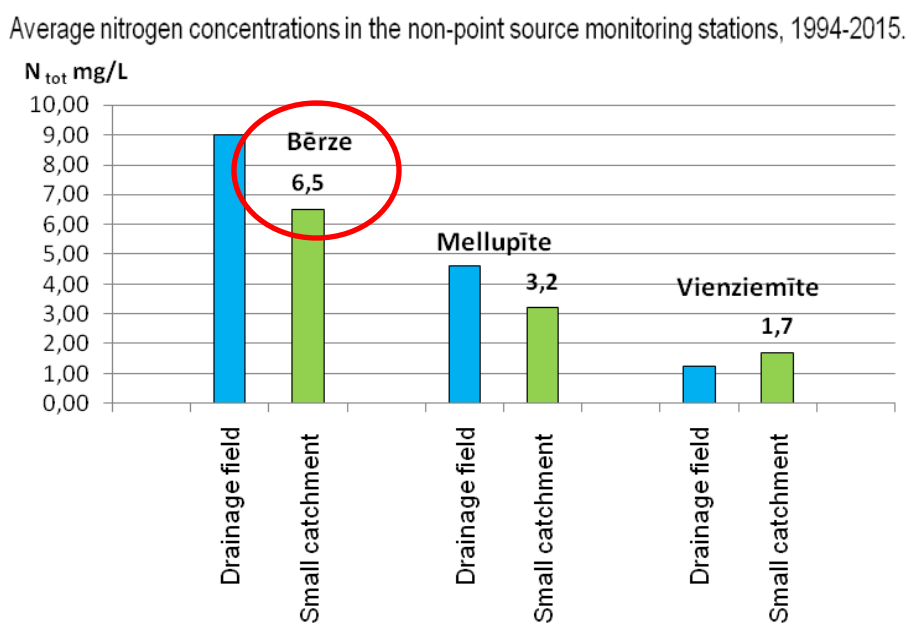
Monitoring methods

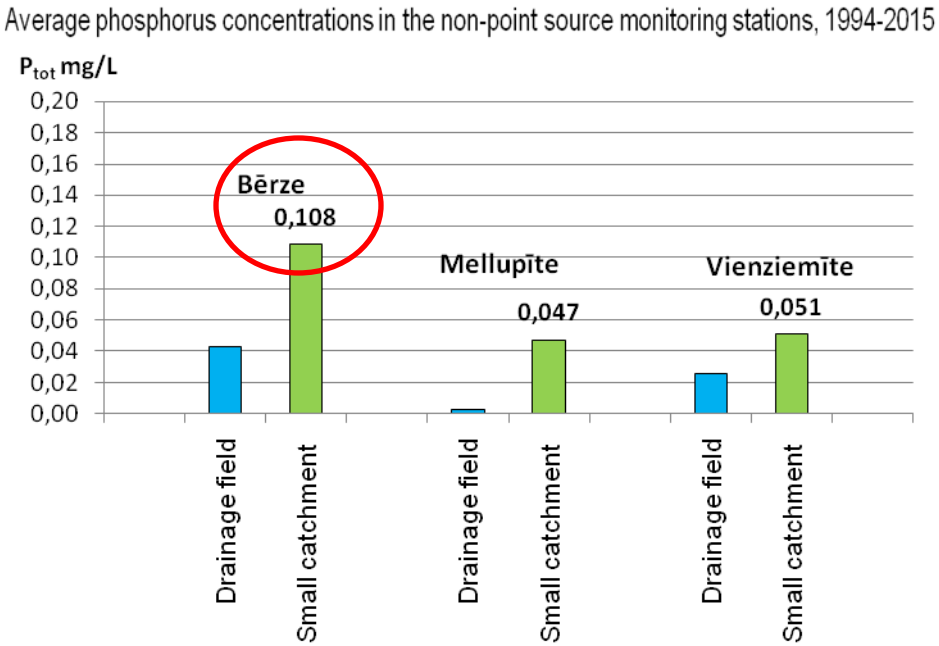
Impact of other pollution sources should be excluded, thus providing information on agricultural non point source pollution in several geographical scales:



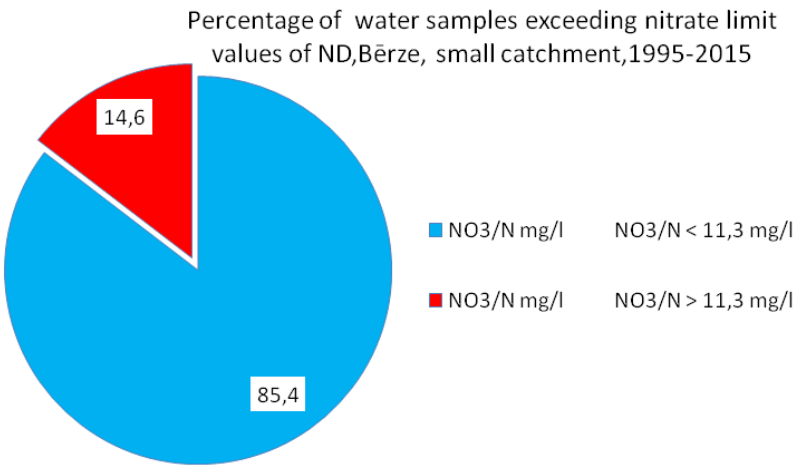


Monitoring results (non point source)





Nitrate Directive (1991)



Phosphorus ?

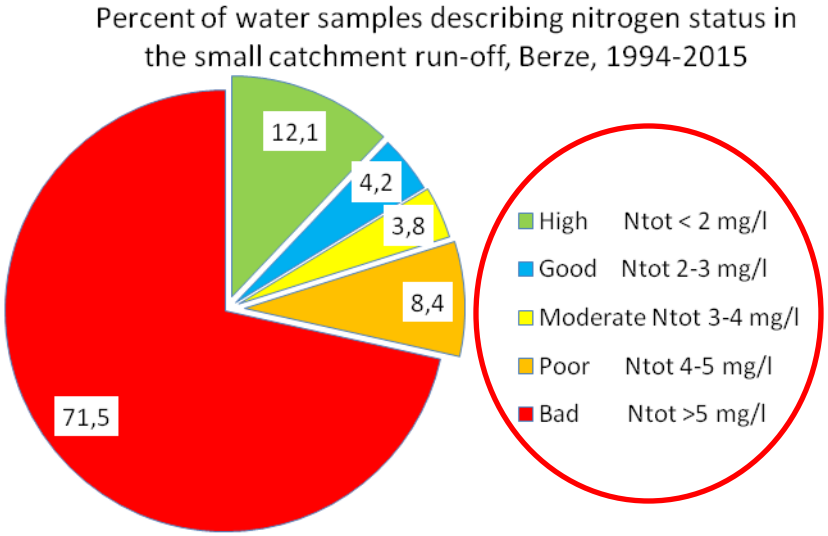
$$P_{tot} = 0{,}05 - 0{,}1 \text{ mg L}^{-1} \text{ ?}$$

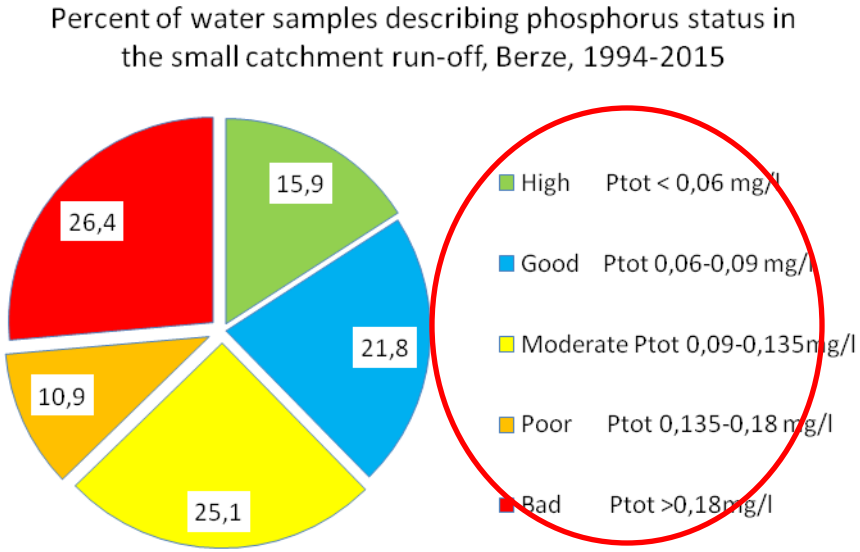
Monitoring results (non point source)

Water Framework Directive (2000)

Good ecological status for water by 2015. Ecological status is determined also by chemical quality elements.

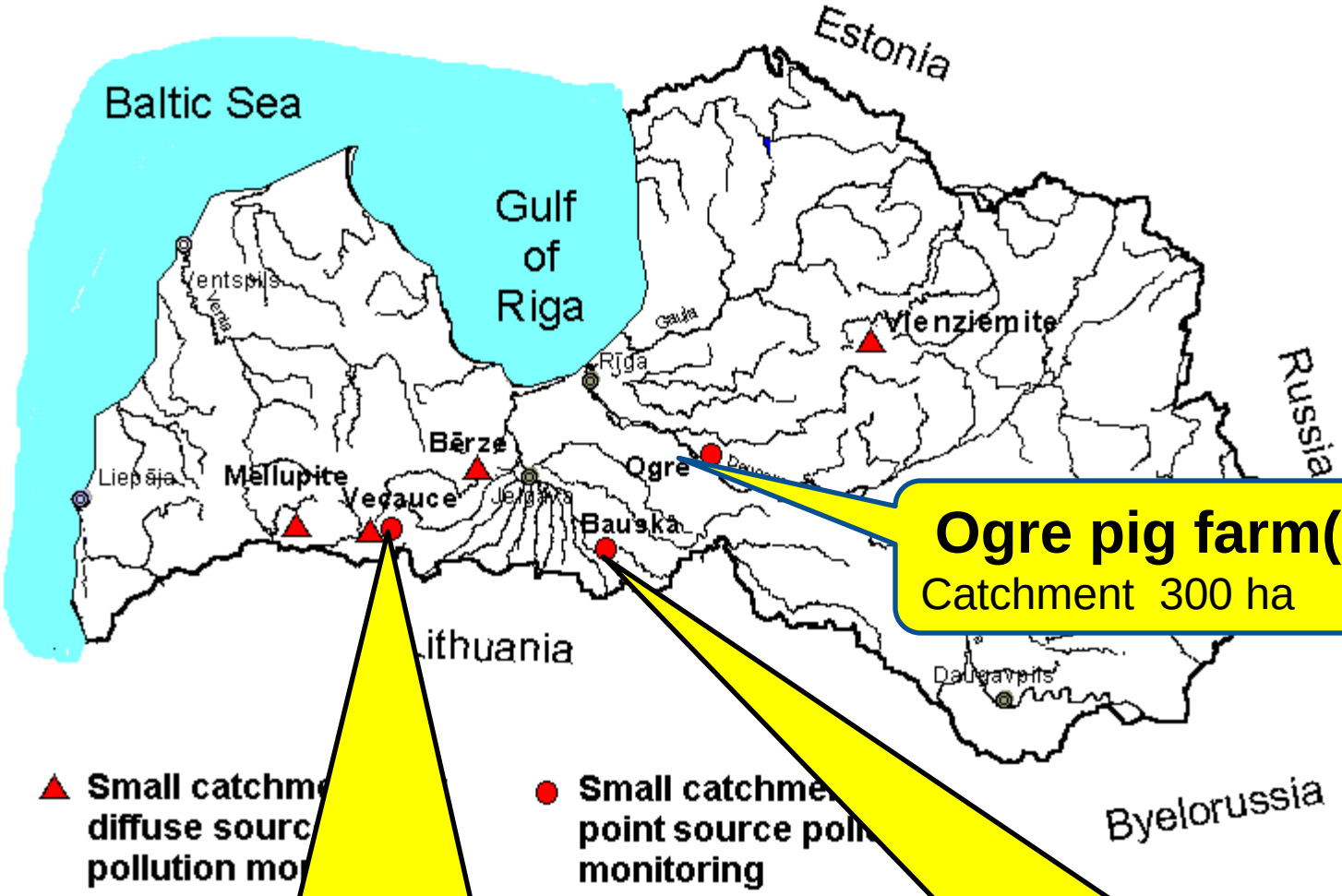
Establishment of reference conditions and class boundaries of the nitrogen and phosphorus?





Does same chemical water quality criteria should be used for river water bodies and also for run-off from fields of the agricultural land (drainage collectors) / small catchments (drainage channels, small rivers)?

Point source agricultural pollution monitoring



Ogre pig farm(1995)
Catchment 300 ha

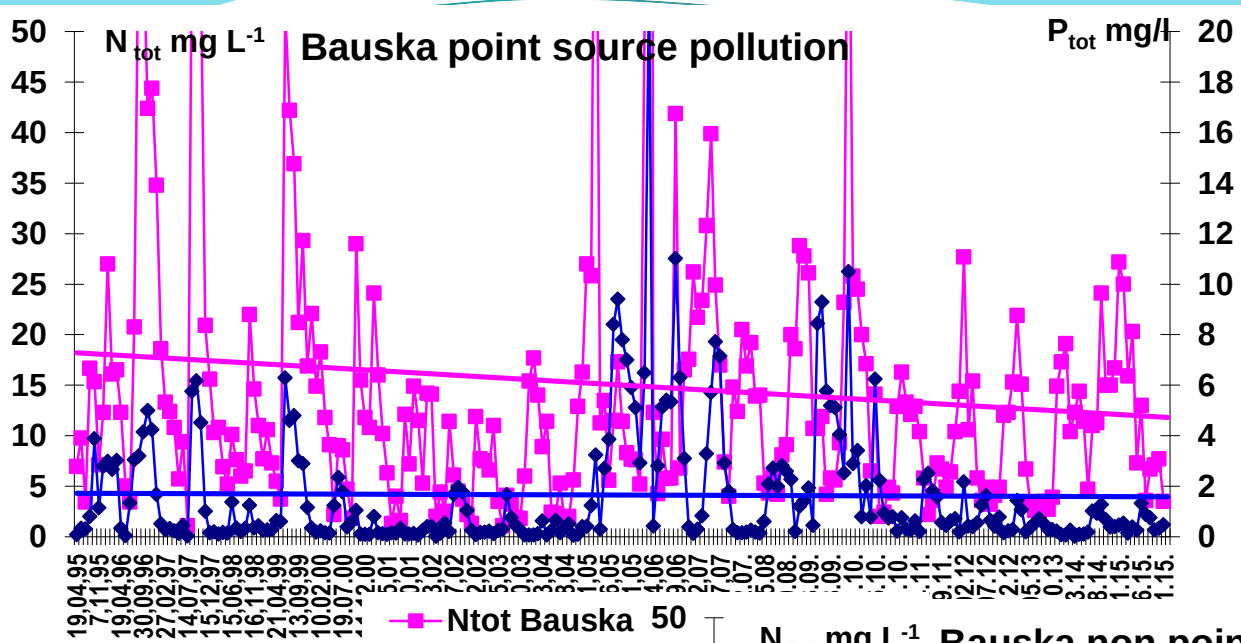
Auce pig farm (1995)
Sm.catchment **60** ha

Bauska pig farm (1995)
Sm.catchment 800 ha

Bauska farm

The Bauska farm (12 000 fattening pigs per year, 55 000 m^3 pig slurry per year) was established in 1976. Until 1987 tractor moved tai
1987 a slurry irrigation system was installed (226
000 fattening pigs, but the slurry utilisation area
Small catchment - 800 ha(slurry lagoons, dumpin
Another catchment -750 ha of intensive agricultu

Bauska farm

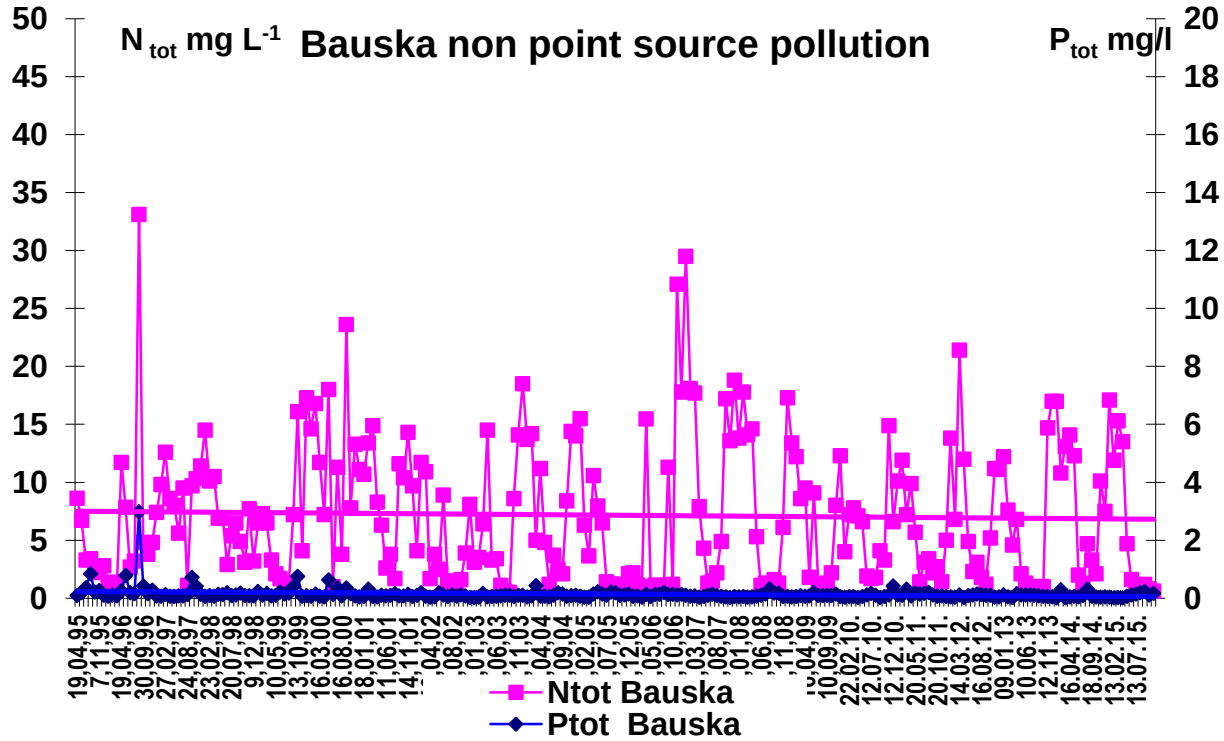


Average 1995-2015, 246 water samples
N_{tot}= 15,2 mg L^{-1} P_{tot}=1,65mg L^{-1}

Average 2015. g. 11 water samples
N_{tot}= 12,8 mg L^{-1} P_{tot}=0,52mg L^{-1}

Average 1995-2015, 244 water samples
N_{tot}= 7,15 mg L^{-1} P_{tot}=0,14 mg L^{-1}

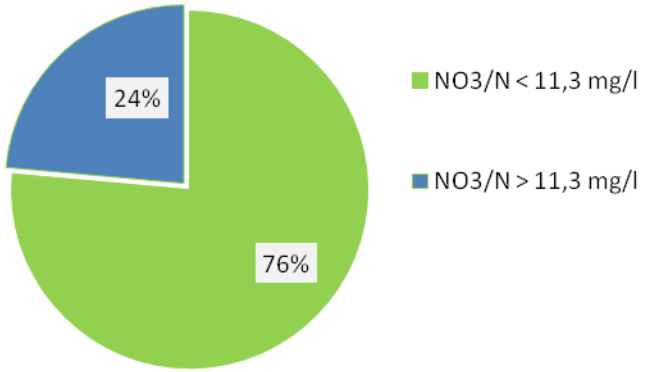
Average 2015. g. 11 water samples
N_{tot}= 6,14 mg L^{-1} P_{tot}=0,09 mg L^{-1}



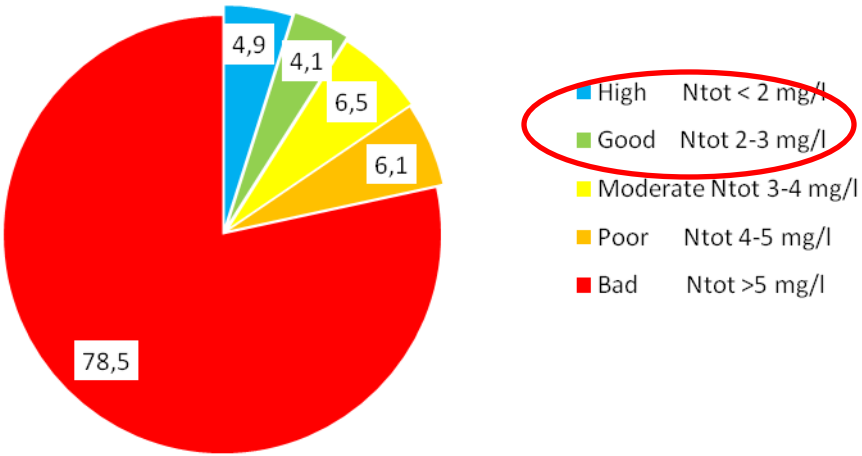
Water Framework Directive

Nitrate Directive

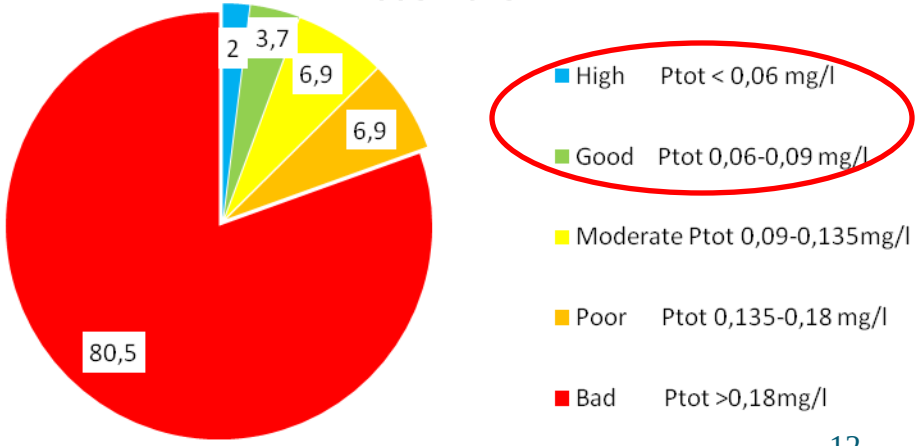
Bauska farm, percentage of water samples exceeding nitrate limit values of ND,1995-2015



Percent of water samples describing nitrogen status in the small catchment run-off, Bauska farm. 1995-2015



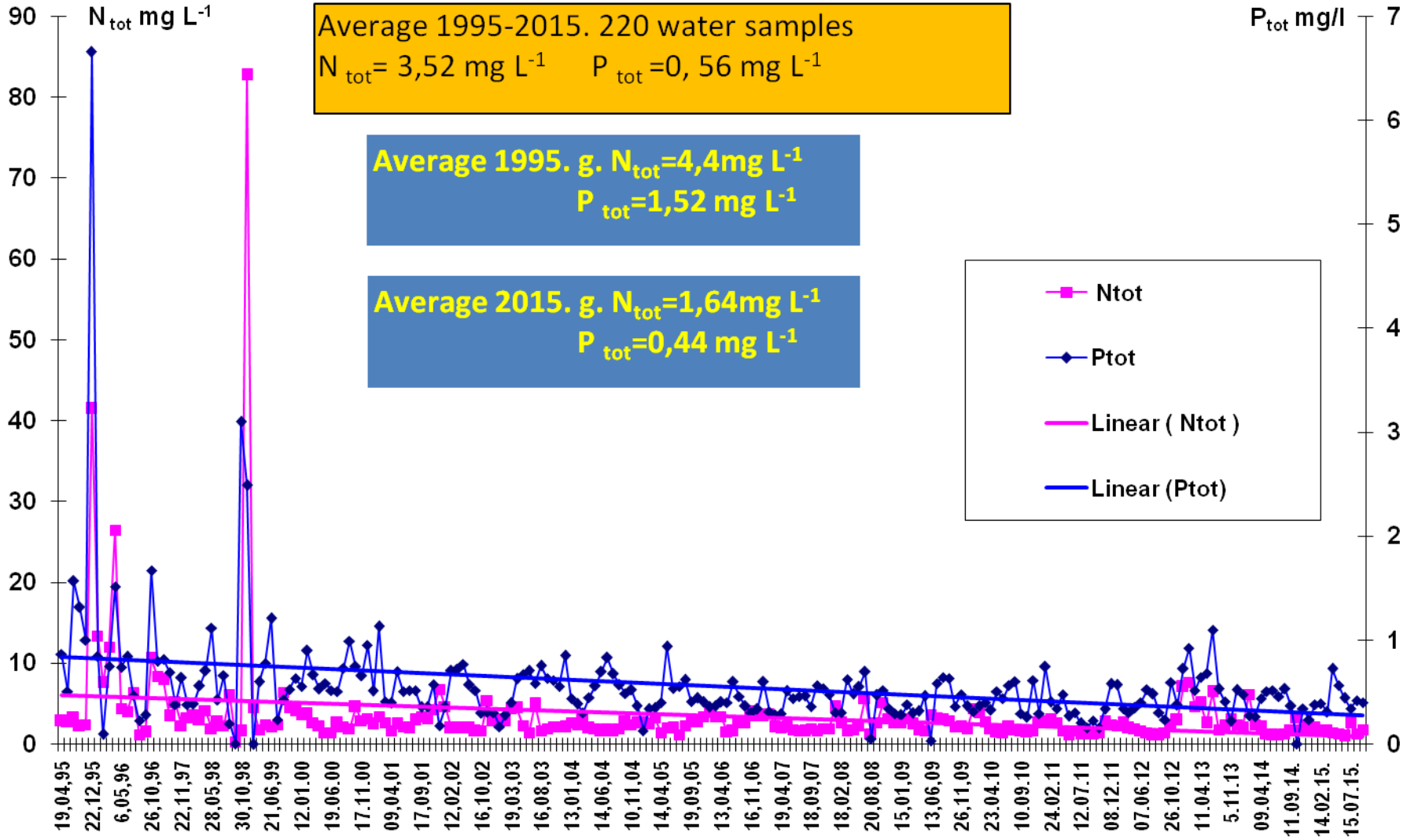
Percent of water samples describing phosphorus status in small catchment run-off, Bauska farm. 1995-2015



Ogre farm

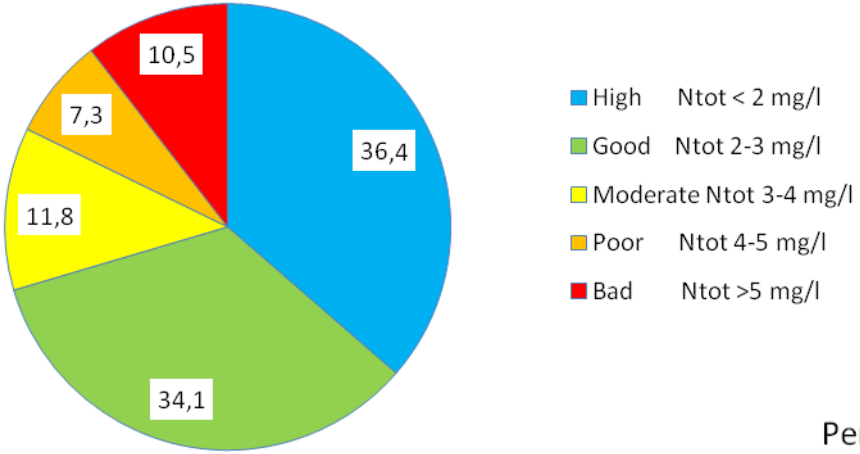
The farm was built for 30 000 slaughtering pigs in 1974. Slurry application in area of 462 ha (slurry 137000 m3/year). The farm was closed in 1992.

Monitoring area - small catchment 300 ha. Several old lagoons still are full with slurry sediments. Heavy polluted slurry dumping sites due to leakage accidents.

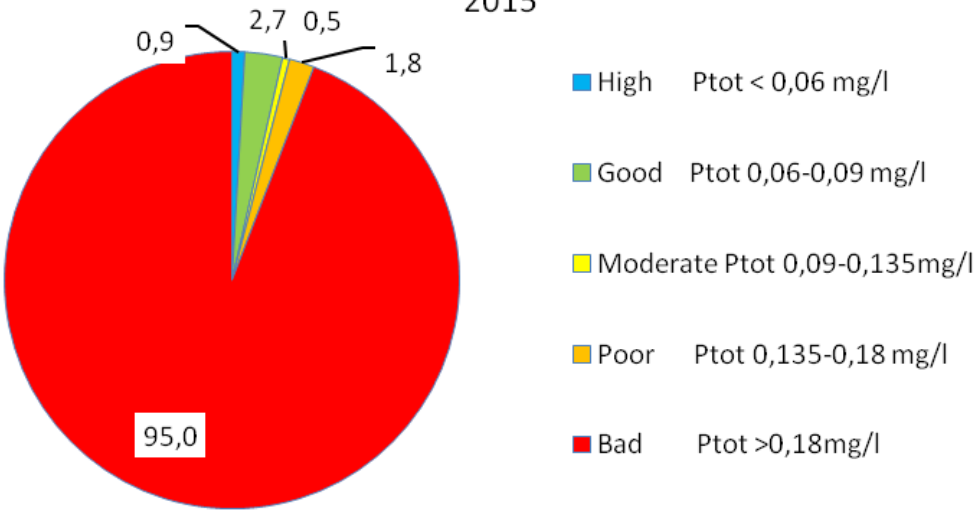


Water quality, Ogre farm

Percent of water samples describing nitrogen status in the small catchment run-off, Ogre farm. 1995-2015

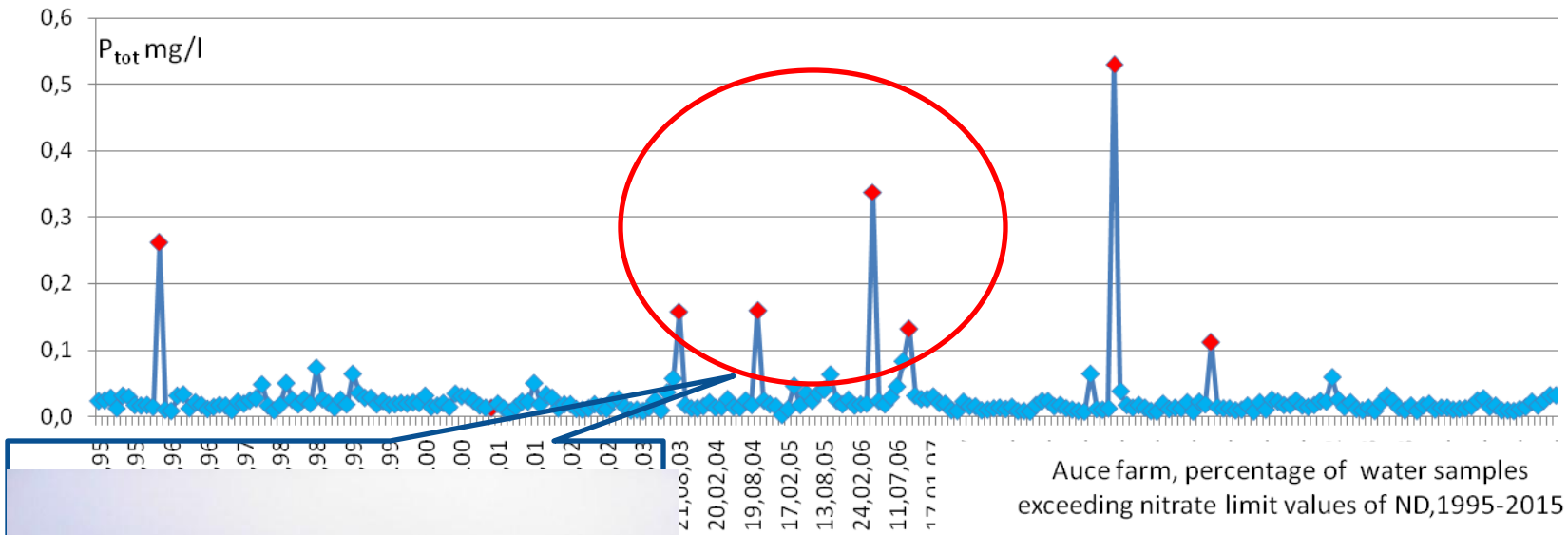


Percent of water samples describing phosporus status in the small catchment run-off, Ogre farm. 1995-2015

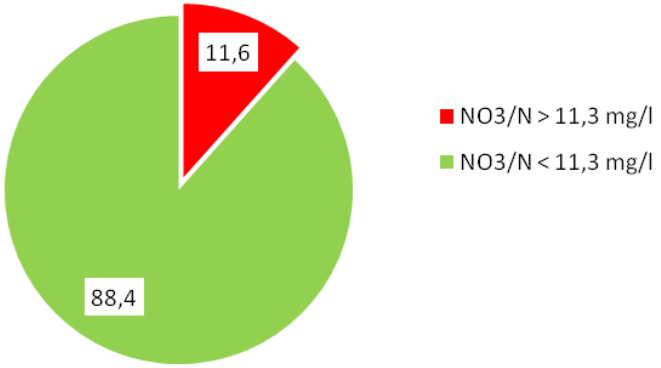


Vecauce farm

Vecauce pig farm was established in 1987 for the production of 6000 fattening pigs per year. After separation, the liquid manure was stored in a lagoon and used for irrigation an area of 32 hectares. Today tractor tankers has been used for spreading of slurry.

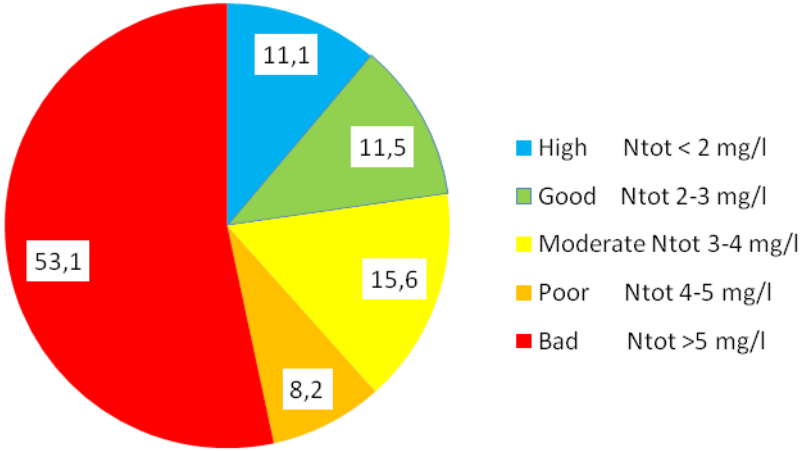


Auce farm, percentage of water samples exceeding nitrate limit values of ND,1995-2015

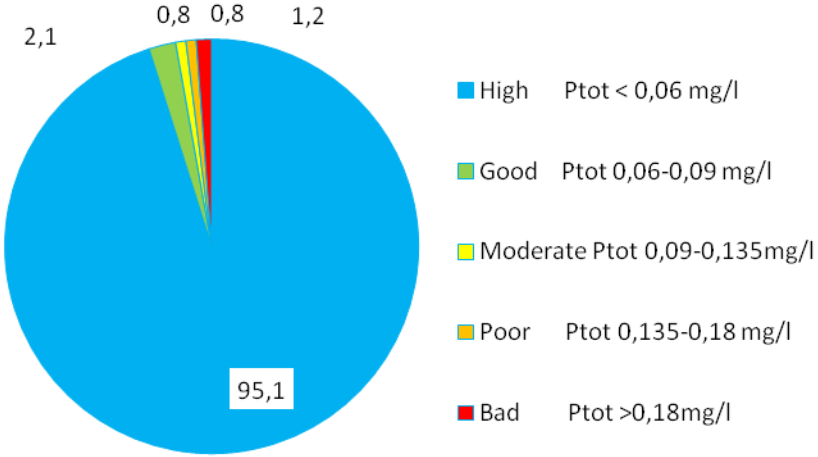


Water quality, Vecauce farm

Percent of water samples describing nitrogen status in the small catchment run-off, Auce farm. 1995-2015



Percent of water samples describing phosphorus status in the small catchment run-off, Auce farm. 1995-2015



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RECOCA. Reduction of Baltic Sea Nutrient Inputs and Cost Allocation within the Baltic Sea Catchments (2008-2011). Bonus programme / Stockholm University

MIRACLE. Mediating integrated actions for reducing eutrophication and flooding impacts in a changing climate (2015-2017). Bonus programme / Linkoping university.

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Thank You for attention!
Questions?