Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Focus on Phosphorus

- a pilot project where farmers, agricultural advisers, researchers and authorities co-operate in

Identifying P loss risk and appropriate mitigation measures at farm level

SLU, Dep. of Soil and Environment — *Katarina Kyllmar, Stefan Andersson, Lovisa Stjernman Forsberg and Barbro Ulén*
SLU, Dep. of Aquatic Sciences and Assessment — *Faruk Djodjic*
Swedish Board of Agriculture — *Johan Malgeryd (Project leader) and Anuschka Heeb*
Farm advisers at:
Växa Sverige, Agrocenter — *Anna Aurell-Svensson*
Hushållningssällskapet Halland — *Erik Ekre*
HS Konsult AB — *Jonas Gustafsson*
The farmers in the pilot catchments

Outline

- The pilot project
- Pilot catchments
- Risk identification and suggestions on mitigation measures
- Effect on water quality of mitigation efforts so far
- Experiences from the project

The pilot project 'Focus on Phosphorus'

Aim:

Using the experience and knowledge from farmers, agricultural advisers, researchers and authorities in order to …

- find effective strategies to reduce P losses from agricultural land to waters
- test and implement both established and new mitigation measures

Project areas should be small agricultural catchments where monitoring data is already available

The project started in 2007 with the Swedish Board of Agriculture as project leader

Pilot catchments

U8

E23

N33

	Catchment		
	N33	E23	U8
Clay (%)	25	50	60
Arable land (%)	87	54	56
Water discharge (mm)	300	180	250
P (mg/L)	0.18	0.23	0.29
P loss (kg/ha)	0.54	0.43	0.75

Coloured areas refers to agricultural production areas

Agricultural management 2006-2010

2006-2009

- Reduced application of P in commercial fertilizer in E23
- The area of buffer strips decreased in all catchments due to changes in subsidies

2010

- Re-establishment of buffer strips in U8
- Structure liming in U8 (90%) and E23 (10%), partly financed by authorities
- Reduced soil tillage in U8 and E23

Self-evaluation of P loss risks at the farm
Questionnaire matrix

Questionnaire matrix covering recent knowledge on

- risk sources for P losses to waters and
- corresponding possible mitigation measures

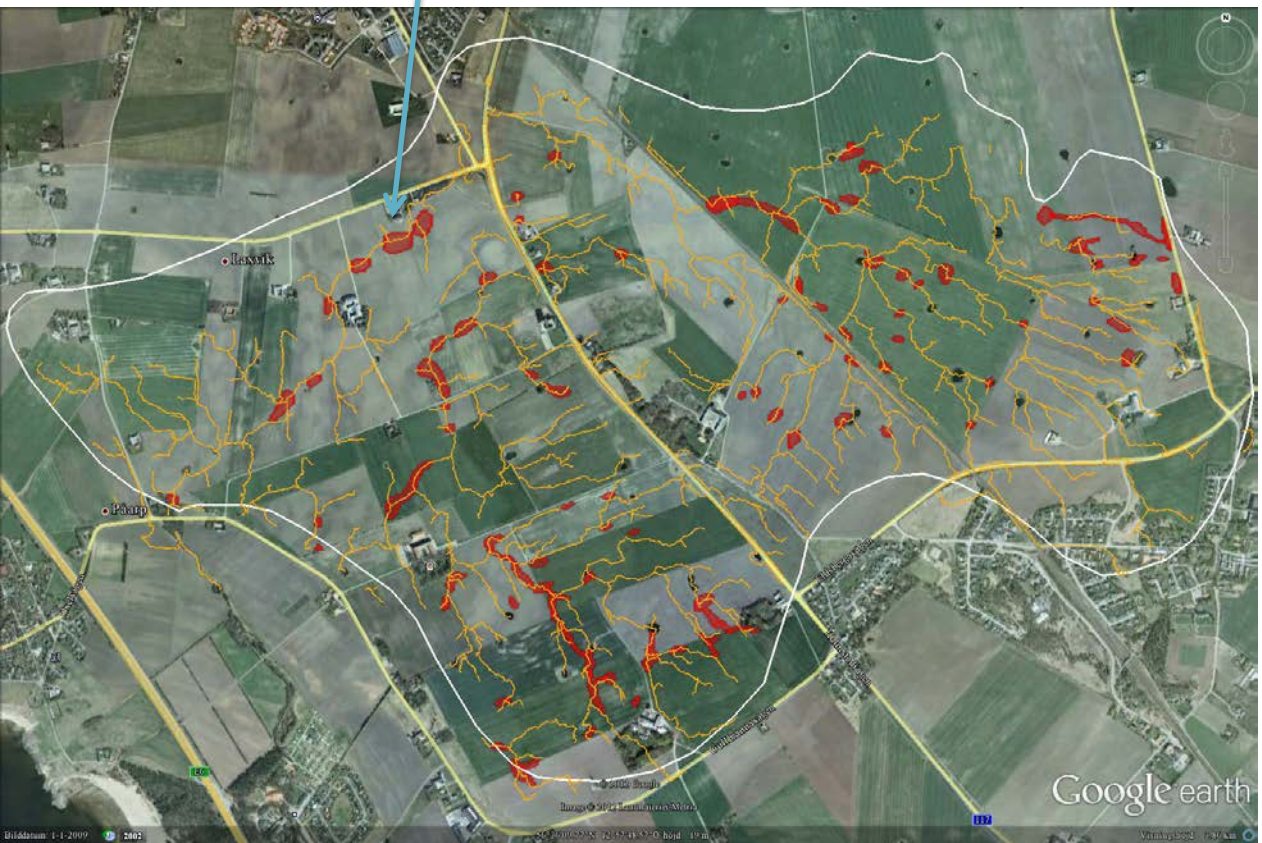
Questions in three categories:

1. Cropping systems including soil tillage and fertilization
2. In-field characteristics including soil properties and function of drainage systems
3. Character of open ditches and water courses

Self-evaluation of P loss risks at the farm
Background information

Modeled maps covering potential risk areas for

- Ponded water
- Surface runoff
- Soil erosion



Maps on soil test results

- P-AL
- pH
- clay content

Information on crop management

Information on water quality in sub-catchments (optional)

The erosion map was developed by using high-resolution elevation data and a distributed model (USPED)

F. Djodjic, 2013

Identification of risk factors

	Catchment		
In cropping systems	**N33**	**E23**	**U8**
Ploughing close to ditches			
Ploughing in late autumn			
High P application rates			
Application of manure in late autumn			
Crop rotations			
In the field			
High P content in the topsoil			
Soil compactation			
Ponding water			
Surface runoff			
Erosion			
In open ditches and water courses			
Flooding			
Erosion in stream banks			
Erosion in stream bottom			
Grazing in the gully			
Removal of vegetation and sediments			

Low risk

Moderate risk

High risk

Suggested mitigation measures

	Catchment		
In cropping systems	**N33**	**E23**	**U8**
Buffer strips and vegatation filters	Possible	Urgent	Possible
Application of manure in spring	Not actual	Possible	Not actual
Fertilization according to soil test results	Not actual	Possible	Not actual
Subsequent crop the same year	Possible	Possible	Possible
In the field			
Reduced soil tillage	Possible	Possible	Not actual
Sowing without soil tillage	Not actual	Not actual	Not actual
Contuor ploughing	Not actual	Possible	Not actual
Ploughing of subsoil	Possible	Urgent	Not actual
Structure liming	Possible	Urgent	Not actual
Restoration of drainage systems	Urgent	Urgent	Not actual
Larger paddocks for horses and cattle	Not actual	Possible	Not actual

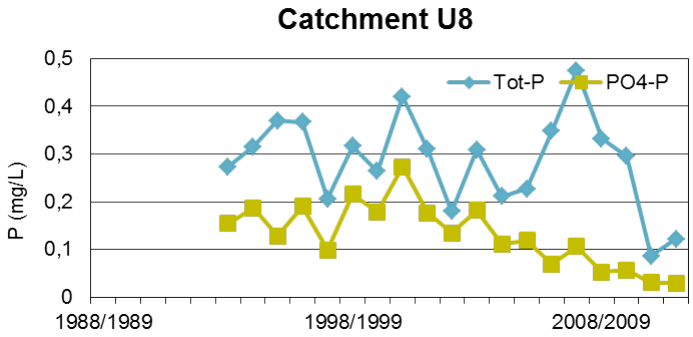
	Catchment		
In open ditches and water courses	**N33**	**E23**	**U8**
Liming above drainpipes	Possible	Possible	Not actual
Liming in connection pipes	Not actual	Not actual	Not actual
Fence for avoiding grazing	Not actual	Not actual	Not actual
Reduce slopes in the gully	Urgent	Urgent	Urgent
Two step flooding ditches	Possible	Possible	Possible
Sedimentation pond	Not actual	Possible	Not actual
Trees and bushes close to the water course	Not actual	Possible	Not actual
Protection from erosion in stream angles	Possible	Urgent	Possible
Convert open ditches to culverts	Possible	Urgent	Possible
Wet land, flooding areas	Not actual	Not actual	Not actual

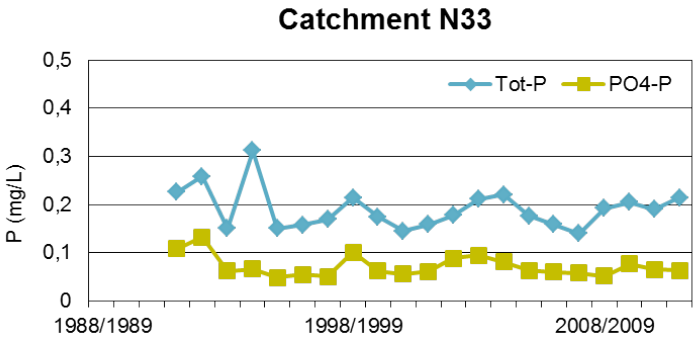
Not actual

Possible

Urgent

Effect of measures on P concentrations at catchment stream outlet





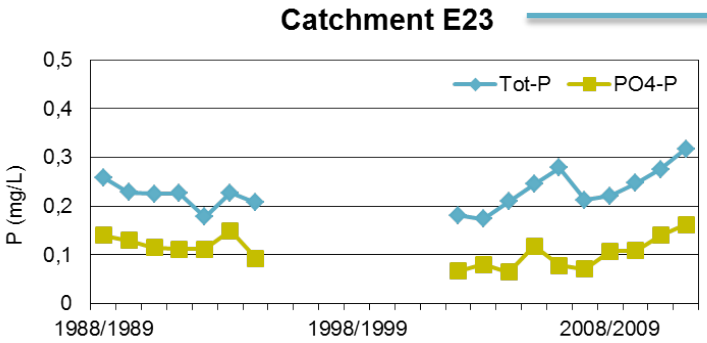


Photo: Anuschka Heeb

Experiences from the project and suggestions for the future

- A questionnaire matrix together with a high-resolution erosion map can be a practical tool for farmers to identify risk areas and appropriate mitigation measures at the farm, preferably together with an adviser
- To have the farmers own knowledge and experience as the driving force in finding the risk sources and adequate measures is probably a most effective approach in reducing P losses
- Measures has to be valuable for the farmer - targeted subsidies may here be useful
- Considering pilot projects in the future, the ideal is if only one measure is implemented upstream each measuring point - otherwise the effect of each measure is hard to determine with just monitoring at catchment outlet