Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

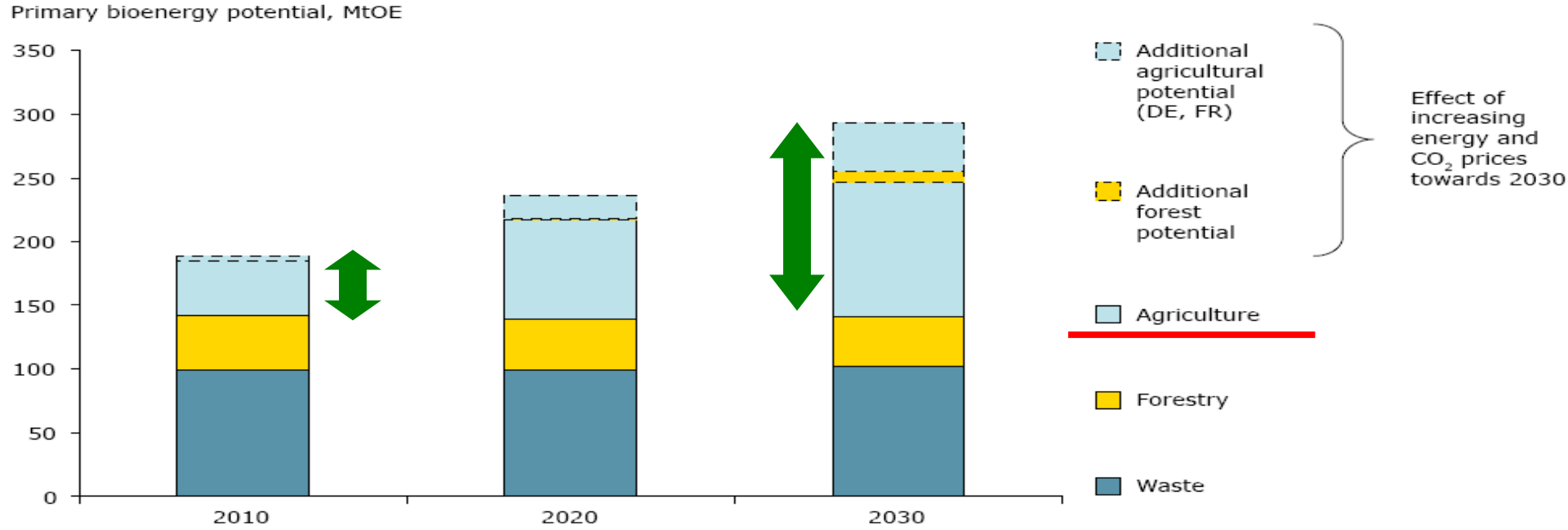
Case studies on Positive Bioenergy and Water Relationships

Assoc. Prof. Ioannis Dimitriou

Swedish University of Agricultural Sciences (SLU), Dep. of Crop Production Ecology

Bioenergy, water and SDG implementation: Experiences and linkages. World Water Week 2017, Stockholm, 31/8/2017

Figure 1 ***Environmentally-compatible*** **primary bioenergy potential in the EU**



Source: EEA (European Environmental Agency) 2006.

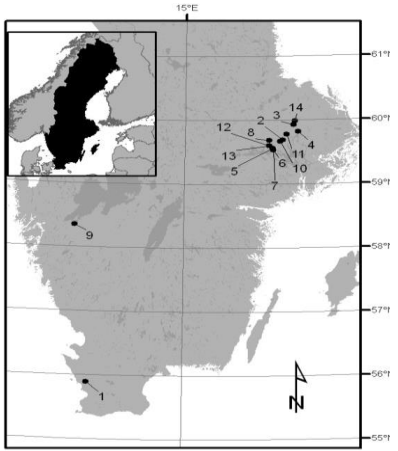
How much bioenergy can Europe produce without harming the environment?

The Challenge

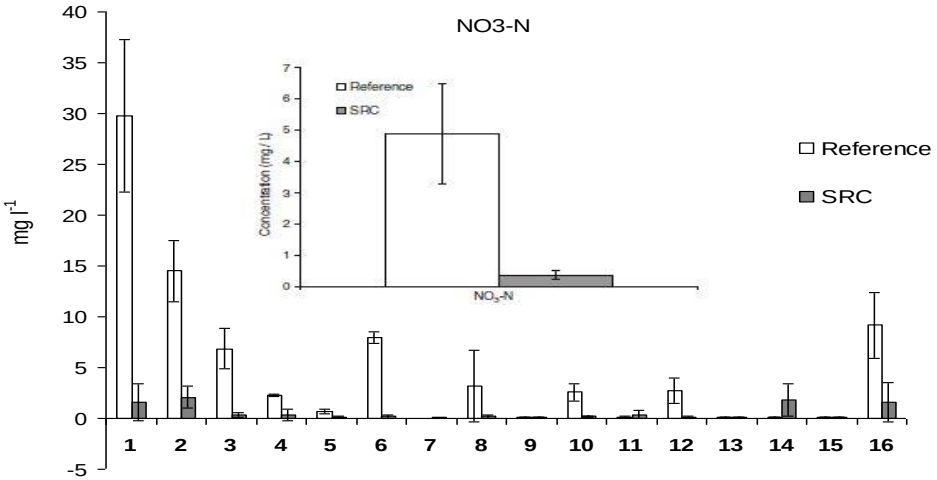
How to integrate new bioenergy feedstock production systems into agricultural landscapes in ways that promote environmental, social and economic sustainability of the agricultural production

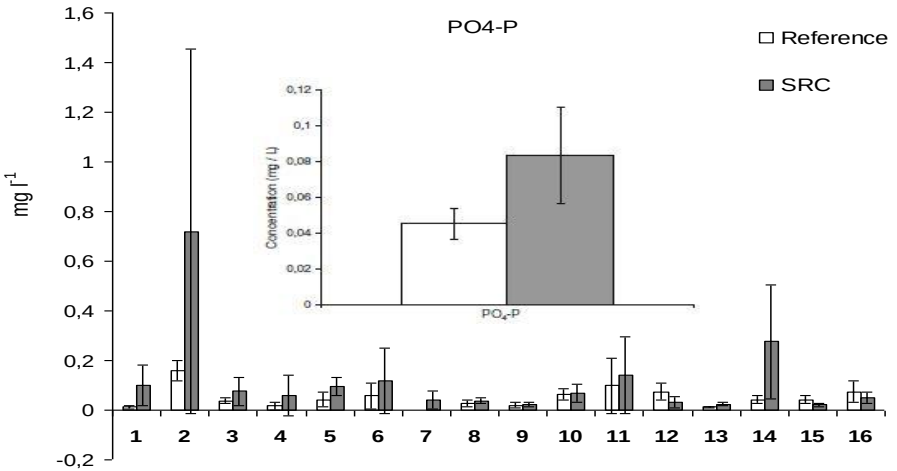
	Name	Year planted	Clone	Reference field	Sludge /Ash	Harvested	Inorganic fertilisation	Soil type (0-20 cm)	Biomass 2009-10	Previous use /before SRC
1	Billeberga I	2002	Sven	Cereals	Y/N (1)	2008	N	sandy loam	8.5**	Sugarbeet
2	Billeberga II	1994	Torhild	Cereals/rapeseed	Y/N (3)	Annually	N	loam	2**	Cereals
3	Djurby Gård	1990	78021	Cereals	Y/N (3)	2007/2011	N	silty clay	5.3	Cereals
4	Forkarby	1995	78112	Cereals	N/N	2008	Y (1)	silty clay	11	Cereals
5	French Trial	1994	78021	Cereals (eco)	N/N	2007/2010	Y (8)	clay loam	9.3	
6	Hacksta	1994	Jorr, Rapp	Peas/cereal	Y/Y (4)	2008	Y (1)	clay loam	4.2	Cereals
7	Hjulsta II	1995	Jorr	No ref	N/N	2008	N	clay	9.6	Oil crops/cereals
8	Kurths trial	1992	Ulv/Rapp	Cereals (eco)	N/N	2007/2010	N	clay loam	12.4	Cereals
9	Lundby Gård I	*2000	Tora	Cereals	Y/Y (1)	2005	Y (1)	clay	4.9	Cereals
10	Lundby Gård II	1995	78021	Cereals	N/N	2005	N	clay	2.5	Cereals
11	Puckgården	1992	78112	Cereals	N/N	2008	Y (4)	silty clay	10**	Cereals
12	Skolsta	1993	78021, Orm	Cereals	Y/Y (1)	2004	Y (2)	silty clay	4	Cereals
13	Säva	1993	Rapp, Orm	Grass	Y/N (2)	2007	N	silty clay	7.4	Cereals
14	Teda I	2000	Tora	Grass	Y/Y (2)	2009	Y (2)	silty clay loam	8	Cereals
15	Teda II	1993	78112	Grass	Y/Y (2)	2007	Y (2)	clay	1.7	Cereals/Set-aside
16	Åsby	1996	Tora	Cereals	Y/Y (1)	2008	Y (2)	silty clay	4.2	Cereals

Tab. 1. Description of the different locations where groundwater pipes were established. *

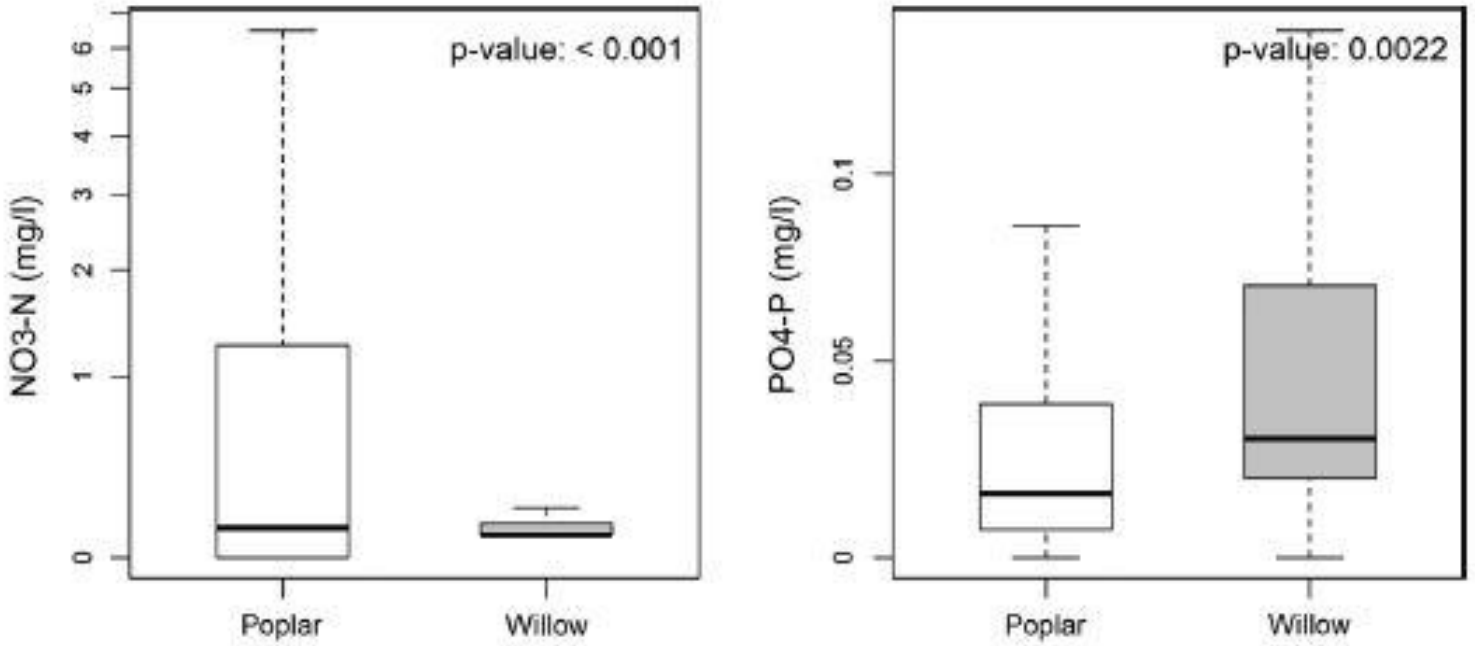


Nutrient leaching





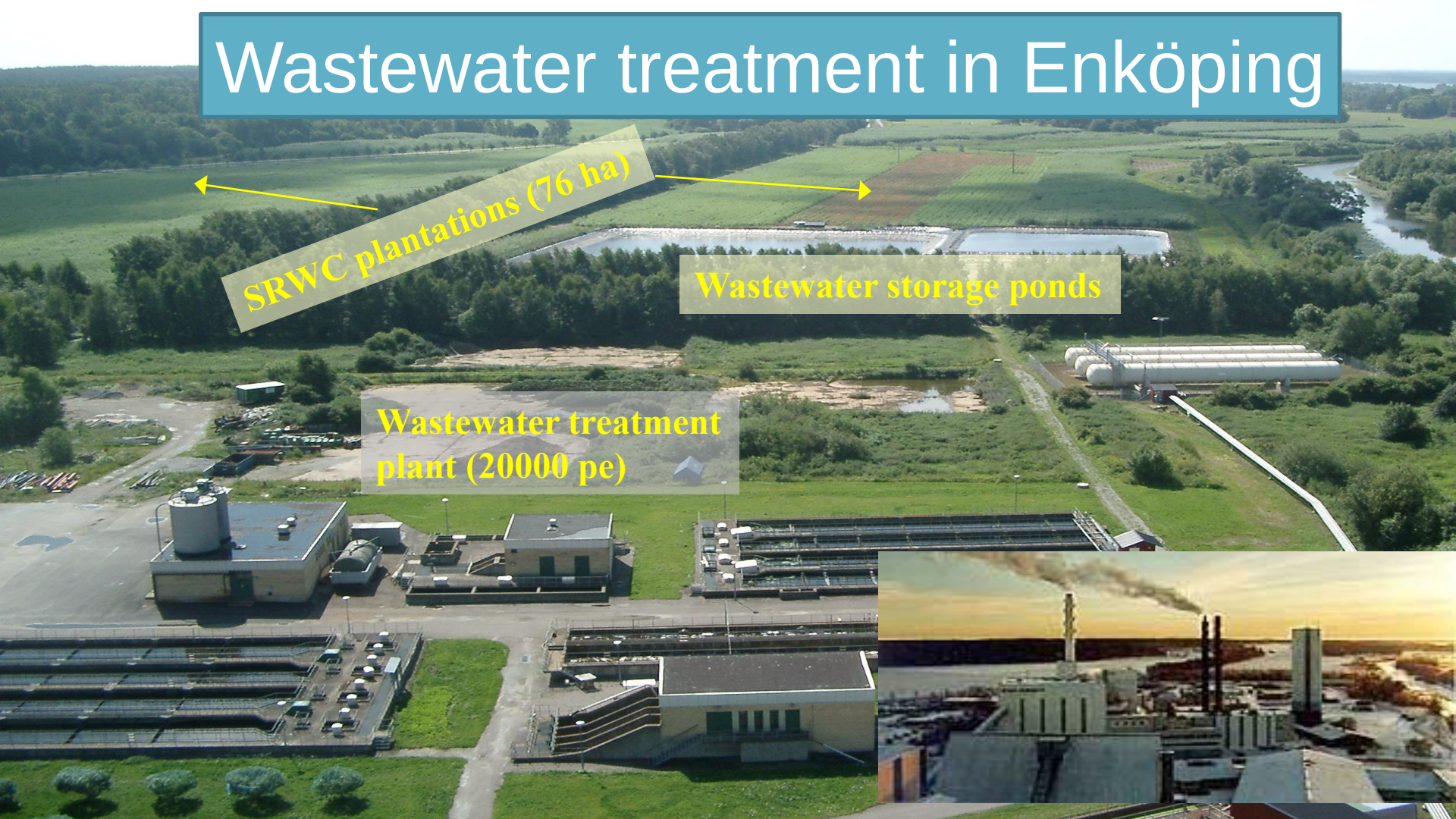
Means, averages and standard errors of NO3–N and PO4–P concentrations in the groundwater of willow short rotation coppice (SRC) plantations and reference fields (Dimitriou et al, 2012 - Bioenergy Research)



Total concentrations of NO3-N and PO4-P in the groundwater. Concentrations of NO3-N and PO4-P are presented in logarithmic scale. The boxes represent the median, upper and lower quartiles, and the bars the maxima and minima excluding outliers.

Riparian buffer zones and bioenergy production

Wastewater treatment in Enköping



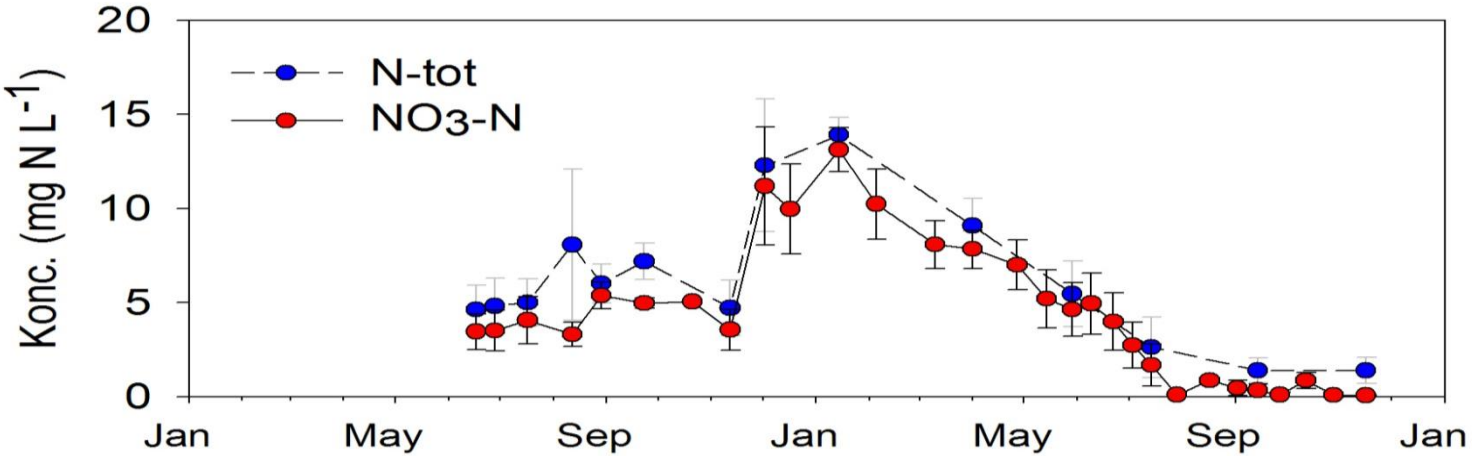
Wastewater treatment in Enköping

- Irrigation with around 2.5 mm per day for around 120 days on 76-ha SRWC
- Ca 150 kg N/ha yr
- N-rich wastewater is diluted by 75% with conventionally treated wastewater
- 11 t N and 0.2 t P are treated after irrigation with 20 000 m^3 N-rich water after sludge dewatering, total irrigation: 200 000 m^3

300 km drip irrigation tubes

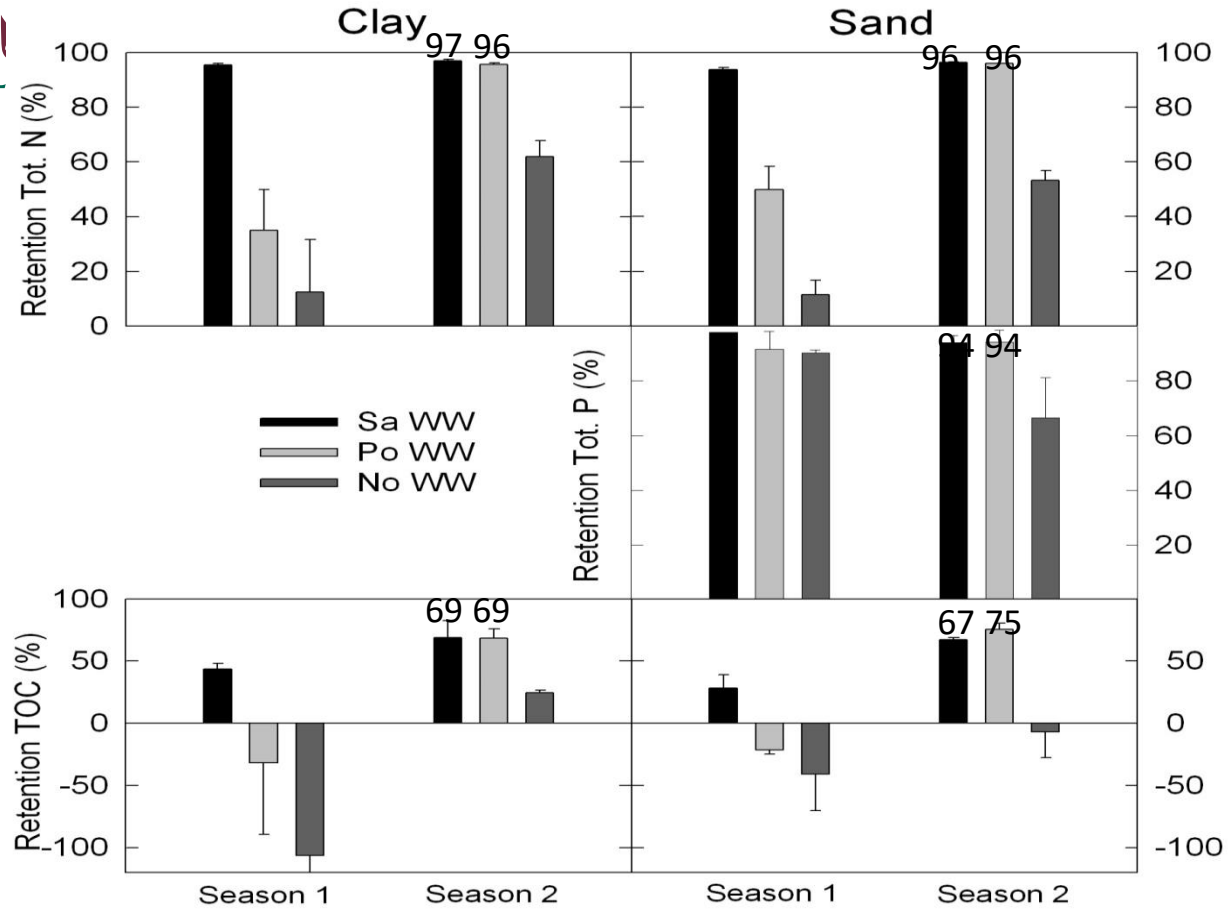
Lined ponds for winter storage

NO_3-N in the groundwater in Enköping



Supply: 150 kg N/ha y

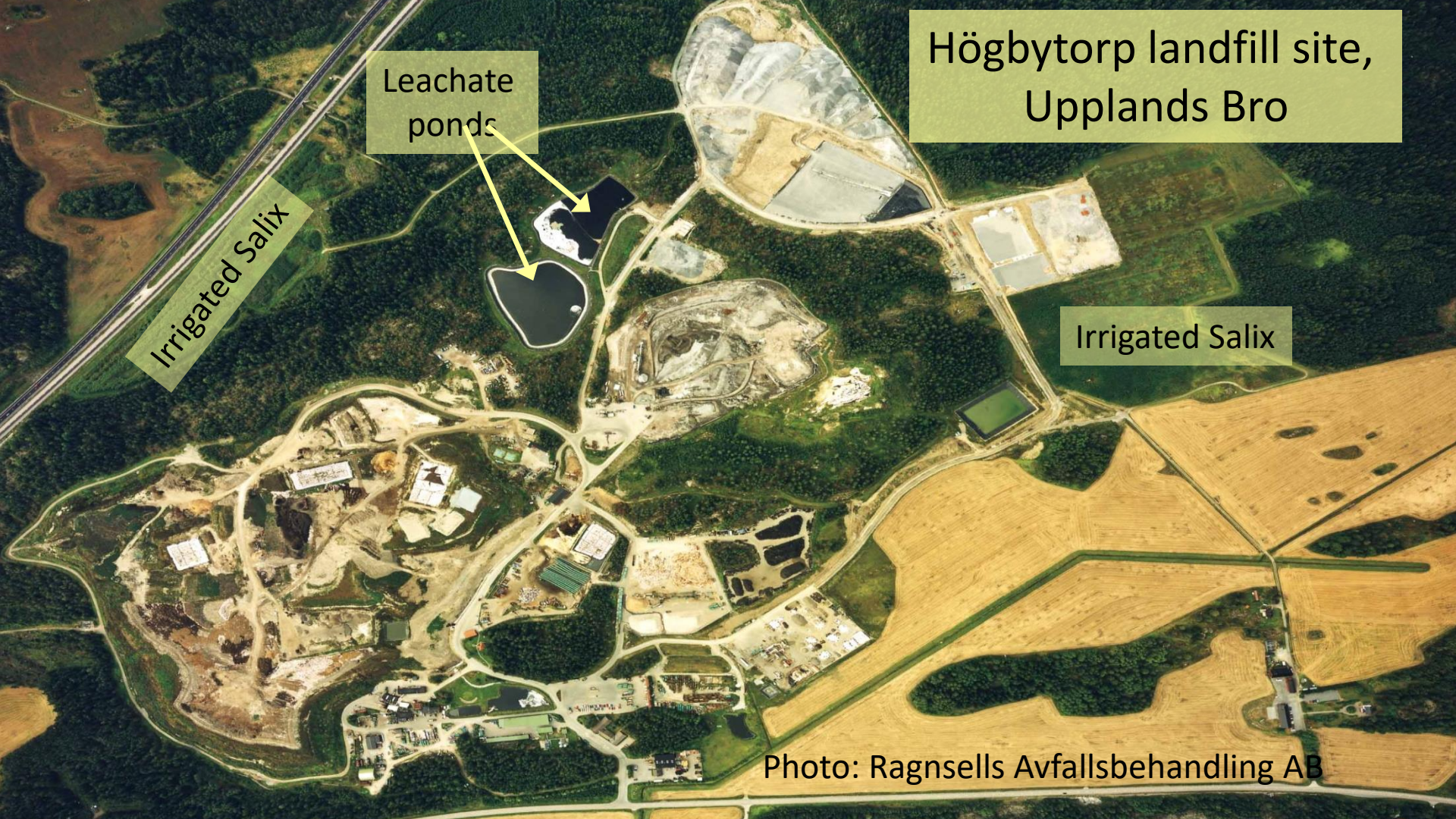
Results provided by: Pär Aronsson (SLU)



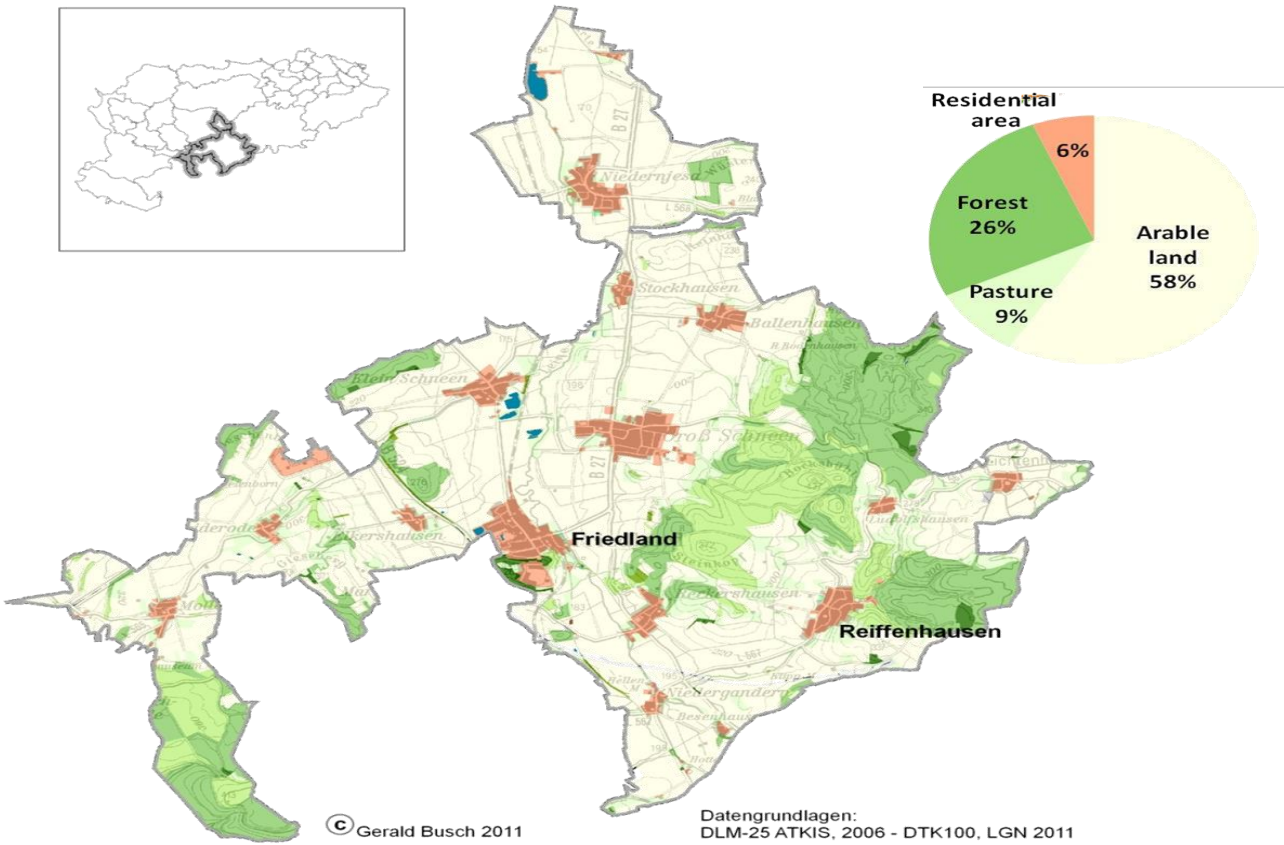
Element		Wastewater conc. (mg/L)
Total N		34.7
Of which	*NH_4-N*	*27.4*
	NO_3-N	*0.2*
	Org. N	*7.1*
Total P		4
TOC		7.5

	Tot. N load (kg/ha)	Tot. P load (kg/ha)
Season 1	262	21.2
Season 2	369	29.8

Relative retention (%) of Tot. N, Tot. P and TOC after wastewater application during two experimental seasons (Dimitriou and Aronsson, Biomass and Bioenergy 2010).

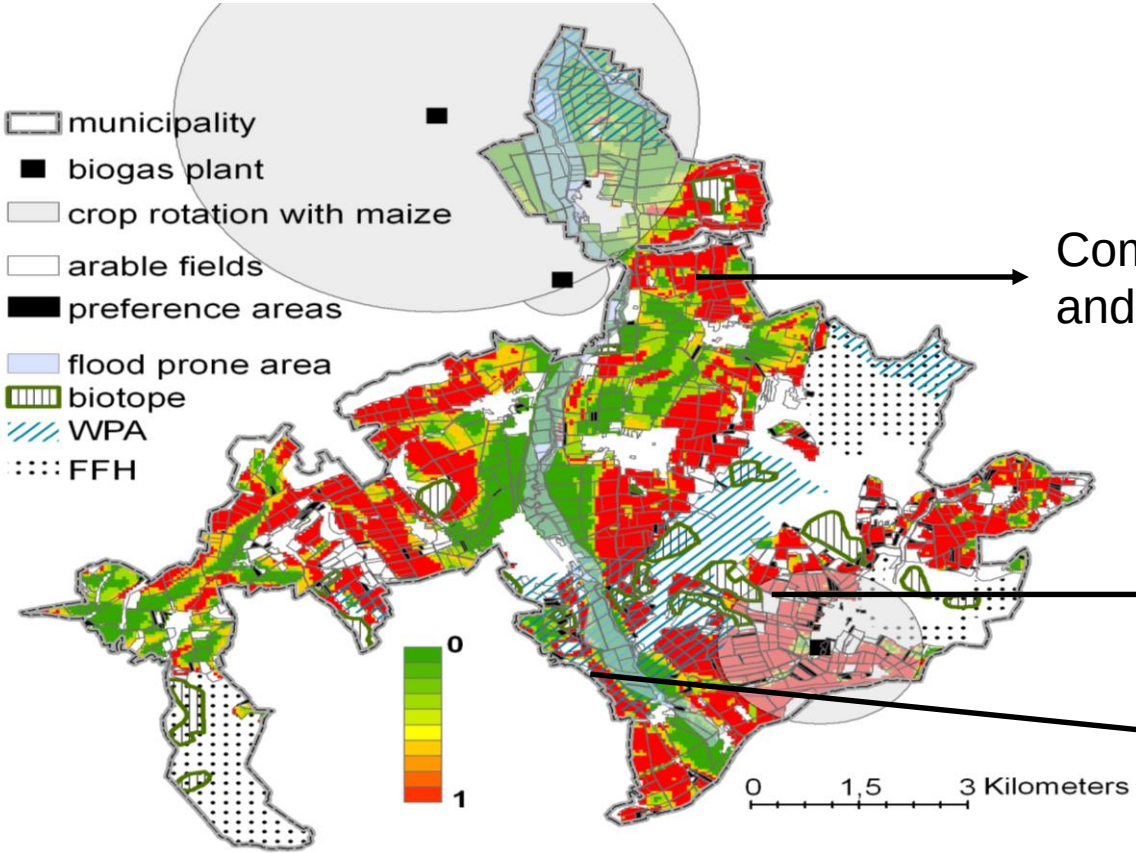

Högbytorp landfill site, Upplands Bro
Leachate ponds
Irrigated Salix
Irrigated Salix
Photo: Ragnsells Avfallsbehandling AB

Municipality of Friedland, DE – erosion, leaching



Case study: G Busch, BALSA

„High disposition to water erosion“



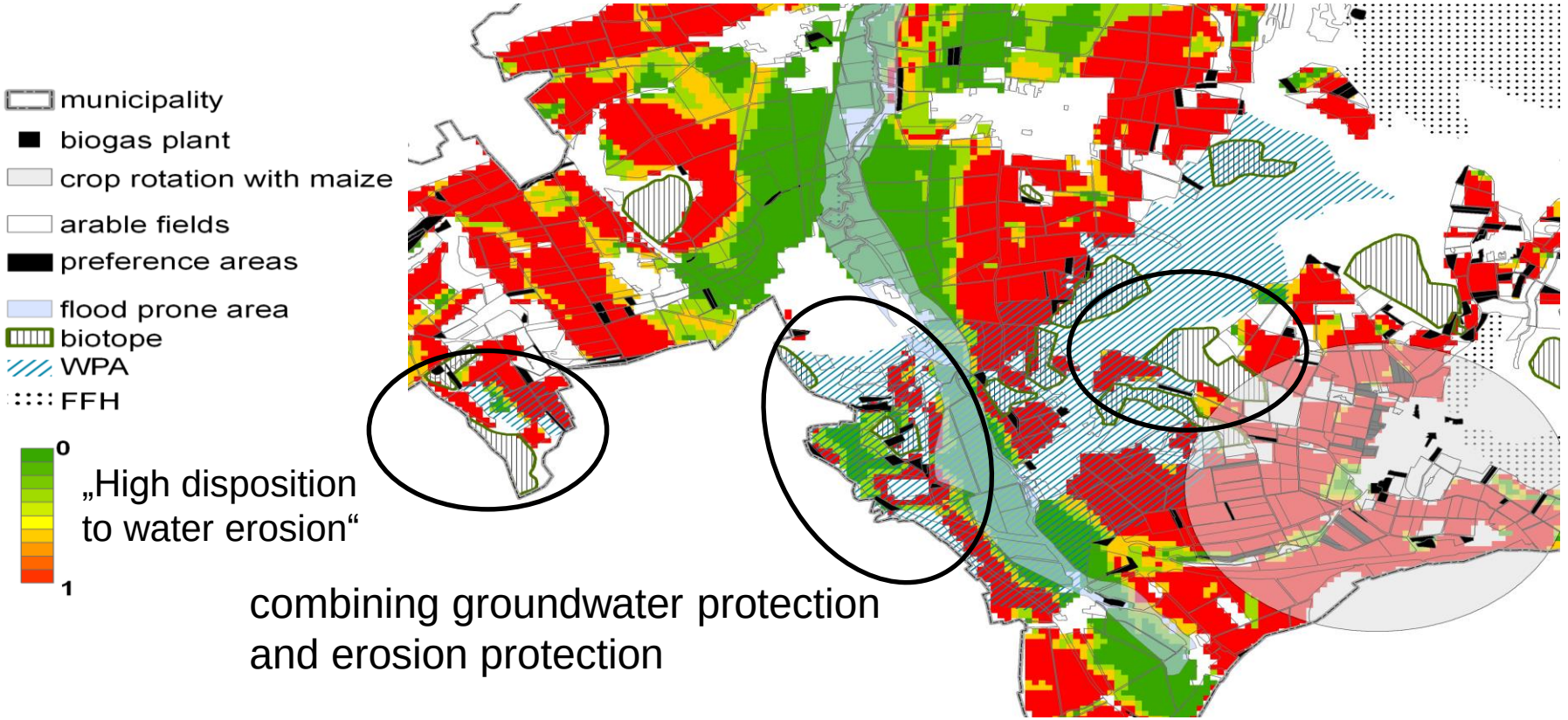
Combination of erosion protection and enhancing(bio)diversity

Reduce increasing erosion risk due to maize

Buffer strips could reduce sediment load

Case study: G Busch, BALSA

… zoom in



Case study: G Busch, BALSA