Optimizing lignocellulosic cropping systems to achieve multiple benefits

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IEA Bioenergy Task 43

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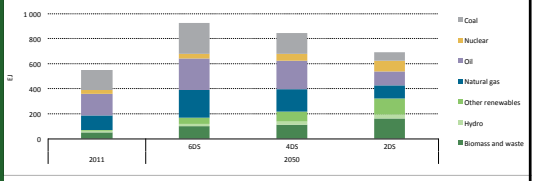
The world needs more land use change

IEA Bioenergy

Bioenergy

- ***significant scope to make a greater contribution to secure and sustainable energy provision***



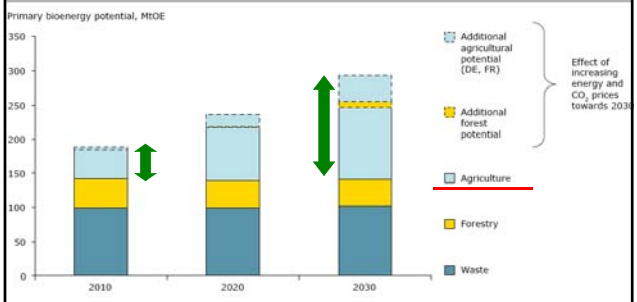
Global modelling results - Total primary energy supply

IEA Energy Technology Perspectives 2014

The Goal

How to go from today's *ca*. 50 to *ca.* 150 EJ/yr in 2050?

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?

Some background

- biomass production in agriculture (and forestry) will have to increase tremendously
- organic waste and by-products from agricultural (and forest) industries can make important contributions but will not suffice to meet anticipated levels
- dedicated biomass production systems for energy will be needed

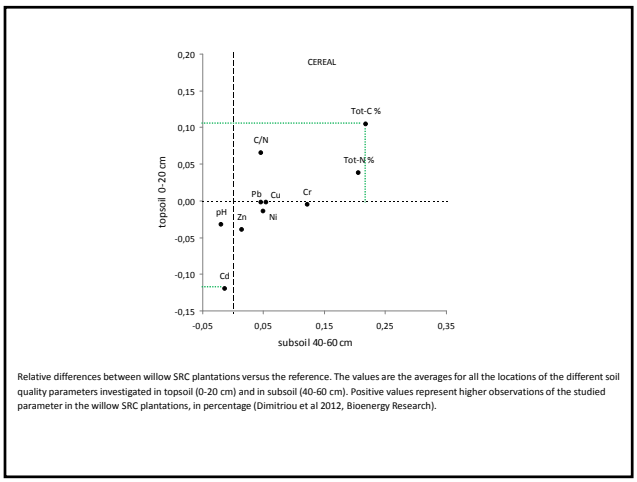
Concerns raised

- potential disruption to food security
- raw material markets and rural livelihoods
- greenhouse gas (GHG) emissions
- ecological impacts associated with land use change
- displacement of small-scale farmers

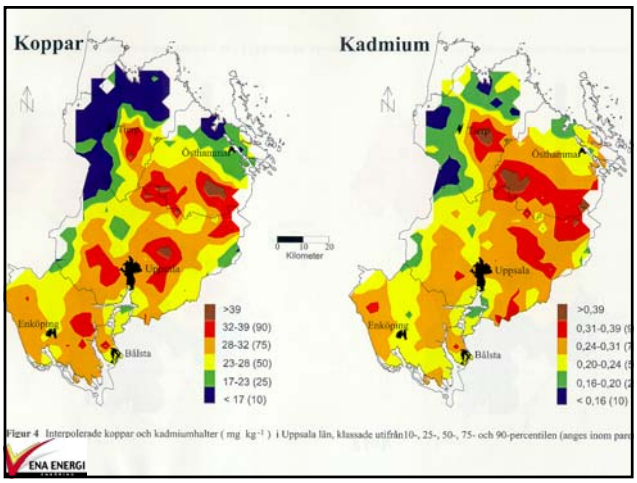
The Challenge

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

So, will we succeed in this?

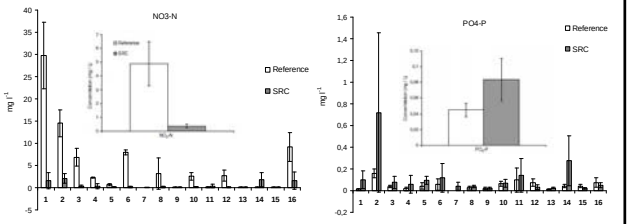


Relative differences between willow SRC plantations versus the reference. The values are the averages for all the locations of the different soil quality parameters investigated in topsoil (0-20 cm) and in subsoil (40-60 cm). Positive values represent higher observations of the studied parameter in the willow SRC plantations, in percentage (Dimitriou et al 2012, Bioenergy Research).



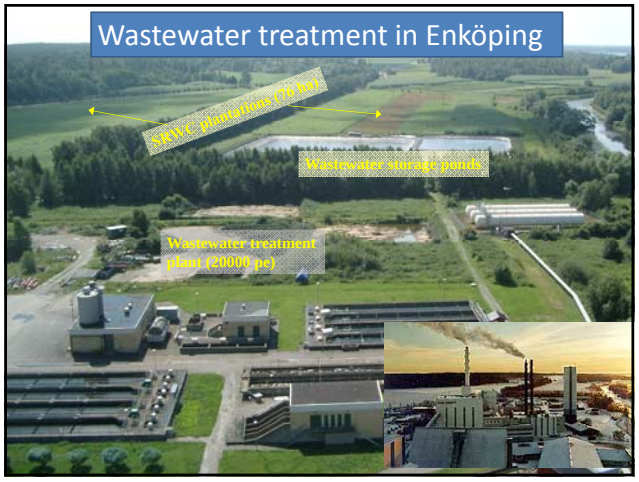
Figur 4 Interpolerade koppar och kadmiumhalter (mg kg^{-1}) i Uppsala län, klassade utifrån 10-, 25-, 50-, 75- och 90-percentilen (anges inom par

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)

SLU



Soil salinization management

Oil Mallee, Australia – Picture: John McGrath

Trees and shrubs can be used to address soil salinity by reducing groundwater recharge, either by using water in the root zone and reducing 'leakage' to deeper aquifers; or by reducing saline or potentially saline groundwater levels (make them deeper beneath the ground surface) through roots directly accessing the water table and increasing discharge.

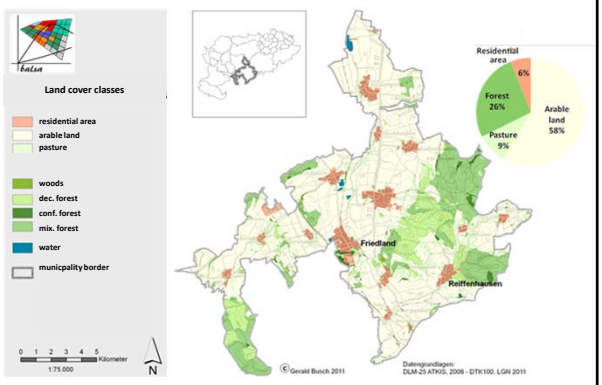
Biodiversity increase?




So, can we succeed in this?

Consider bioenergy systems as an opportunity to design landscapes that add value!

Municipality of Friedland, DE – erosion, leaching



Case study: G Busch, BALSA

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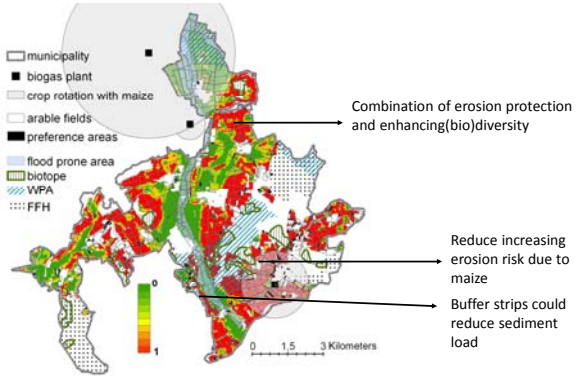
„High disposition to water erosion“



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

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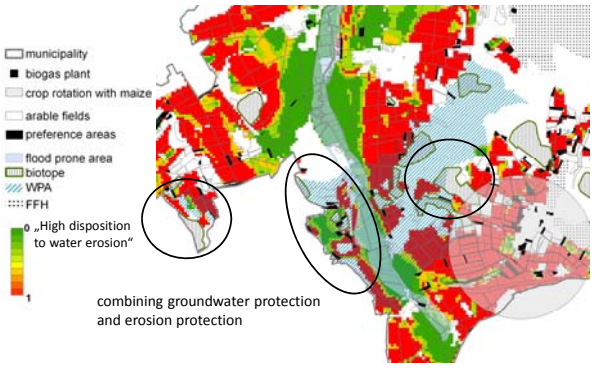
… zoom in



combining groundwater protection and erosion protection

Case study: G Busch, BALSA

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Consider bioenergy systems as an opportunity to design landscapes that add value…

… and use/develop participatory approaches to include stakeholders/decision makers!