

# Exploring the potential of reed as a biofuel crop in the Netherlands

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# Outline

## ■ Introduction

- Reed as a bioenergy crop
- Potential for reed in the Netherlands?

## ■ Methodology

- Spatial exploration: simulating future land-use
- Economics of reed cultivation
- Scenarios

## ■ Results

## ■ Conclusions

# Introduction

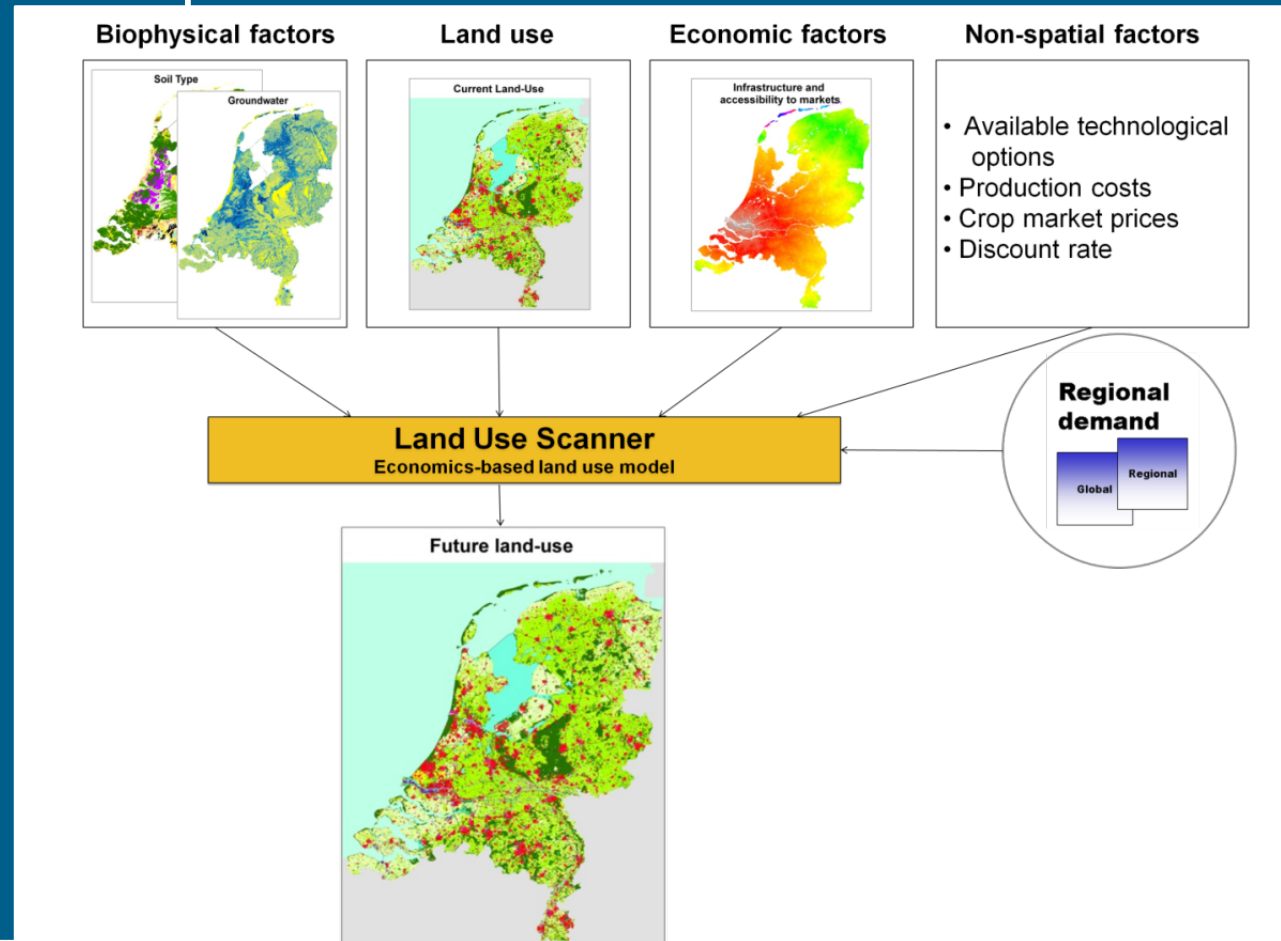
- EU Directive on Renewable Energy targets by 2020:
  - 20% of total energy consumption
  - 10% of total transport fuel consumption
- Reed as a bioenergy crop:
  - Combustion for district heating and electricity generation
  - Biogas (co-digestion with manure)
  - Bioethanol (2<sup>nd</sup> generation biofuel)

# Potential for reed in the Netherlands?

- Indigenous in the Netherlands
- Grows well in wet areas
  - Salt tolerance
  - Suitable for peat soils
- Bioenergy crops are generally low-value products best grown on a large scale
- However, the Netherlands is a densely populated country with high pressure on land and an advanced agricultural sector specialized in high-value crops

# Spatial exploration

- simulation of local competition for land according to economic performance



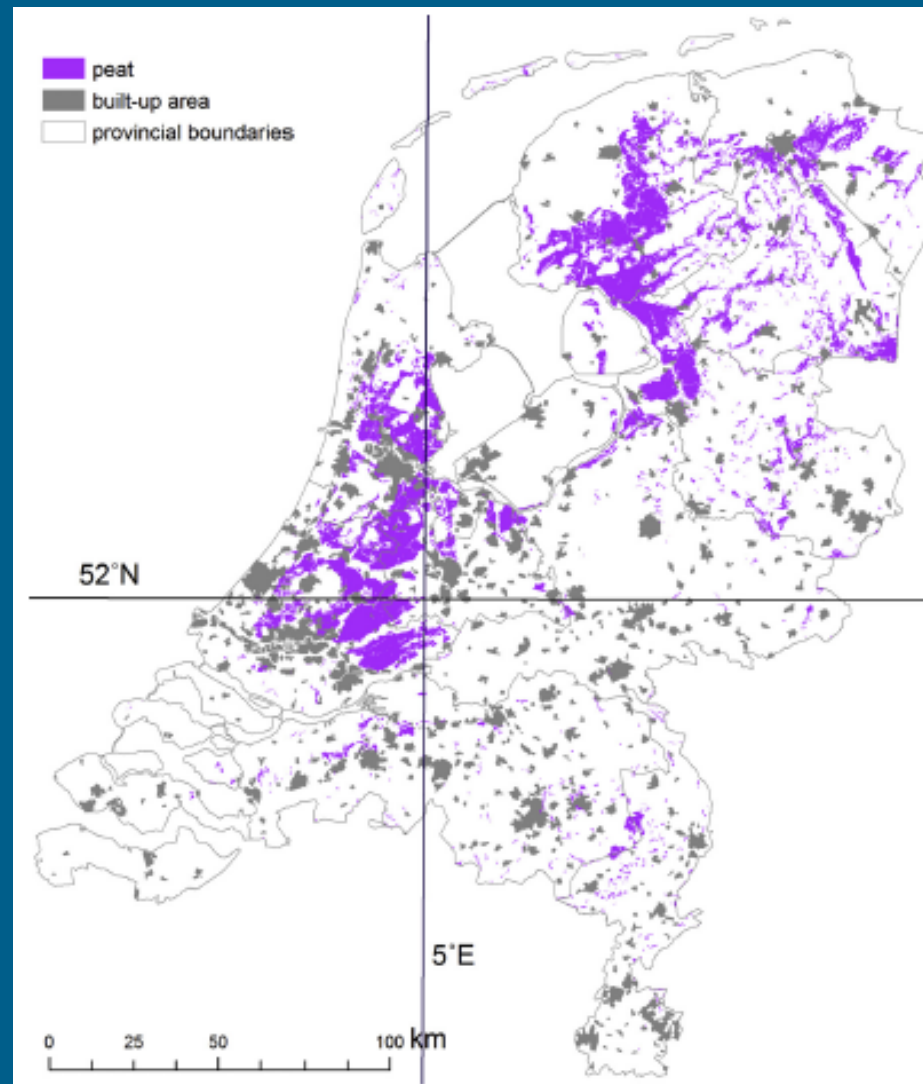
# Economics of reed as bioenergy crop

- Yield (dry biomass): 15 t.ha<sup>-1</sup>.yr<sup>-1</sup> without fertilizer
- Gross revenues (€·ha<sup>-1</sup>·yr<sup>-1</sup>):
  - Ethanol 1,151
  - Combustion 475
  - Biogas 625
- Total production costs (€·ha<sup>-1</sup>·yr<sup>-1</sup>)
  - Ethanol 2,387
  - Combustion 1,285
  - Biogas 1,900

# Reed as a multifunctional land-use

- Water buffering
  - Integrated water management – water storage during floods and dry periods
- Surface water purification
  - Absorption of nitrates and phosphates
- Carbon sequestration above and below ground
- Avoids peat oxidation
  - Subsidence
  - CO<sub>2</sub> emission (loss of organic matter)
  - Risk of saline seepage

# Peat soils in the Netherlands





# Economics of multi-functional reed cultivation

- Additional benefits (€·ha<sup>-1</sup>·yr<sup>-1</sup>, based in previous cost-benefit analysis):
  - Water storage (where applicable): 400
  - Water purification: 400
  - Net effect on GHG emissions: 245
  - Net effect on GHG emissions in peat soils: 271

# Scenarios for 2030

Based on a previous study for EC's DG-ENV

## 1. Reference: IPCC B1

- Ongoing policies, incl. liberalization of agricultural trade

## 2. High oil prices and strong climate change

## 3. Biofuel policies

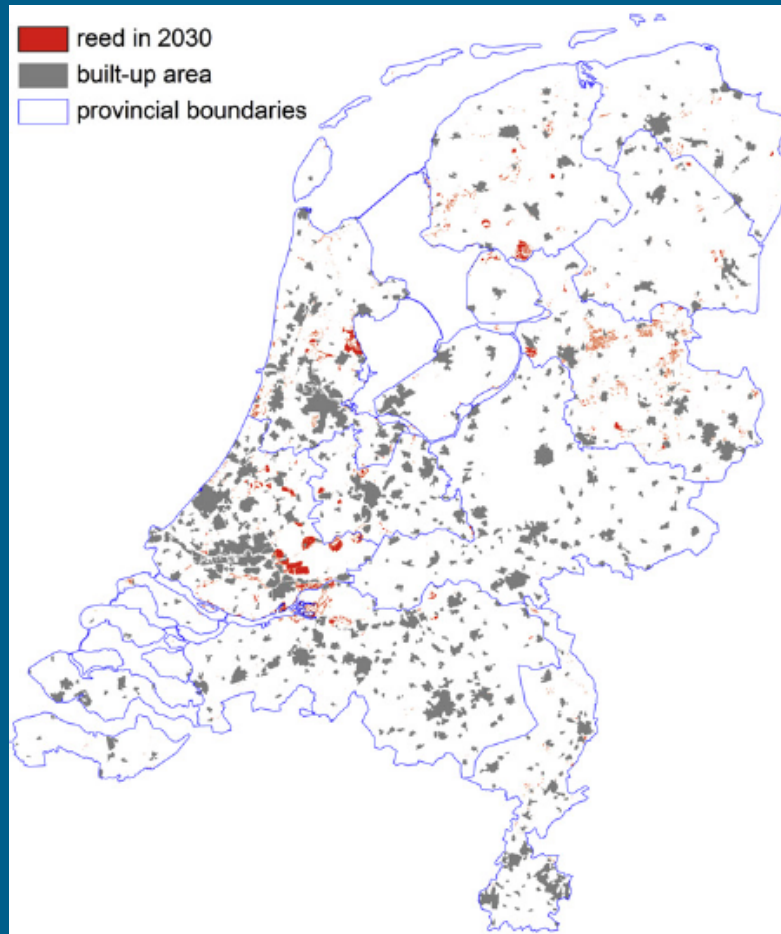
- Promotion of biofuels in EU and rest of the world

## 4. Soil protection and climate mitigation policies

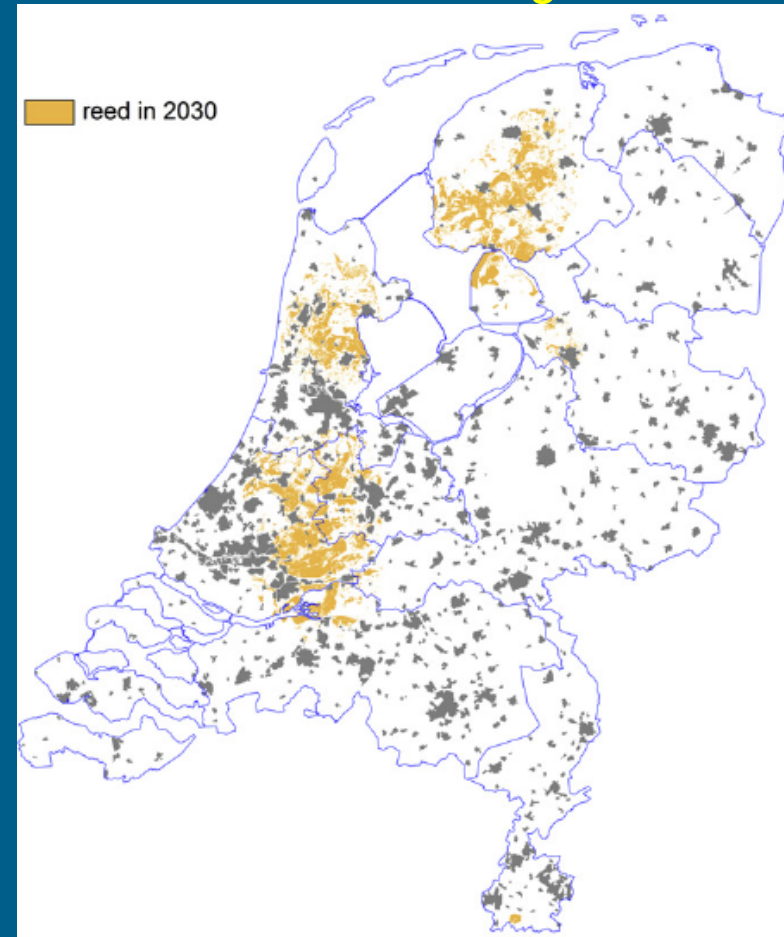
- Increased promotion of water buffering and sustainable use of peat soils

# Results

Scenario 1: IPCC B1

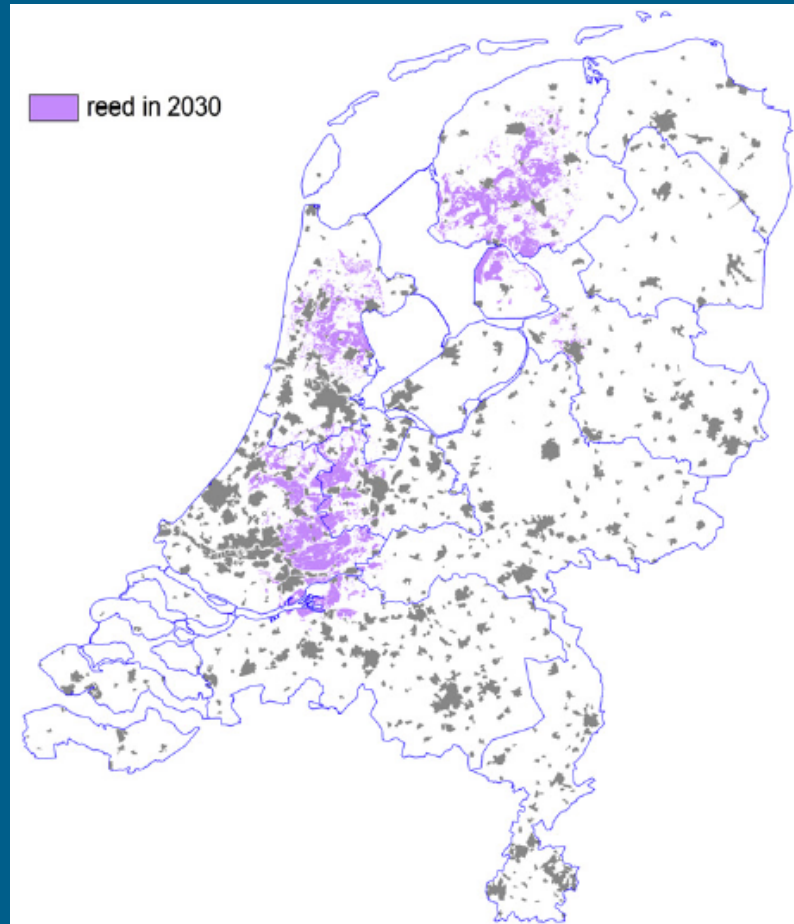


Scenario 2: High oil prices & climate change

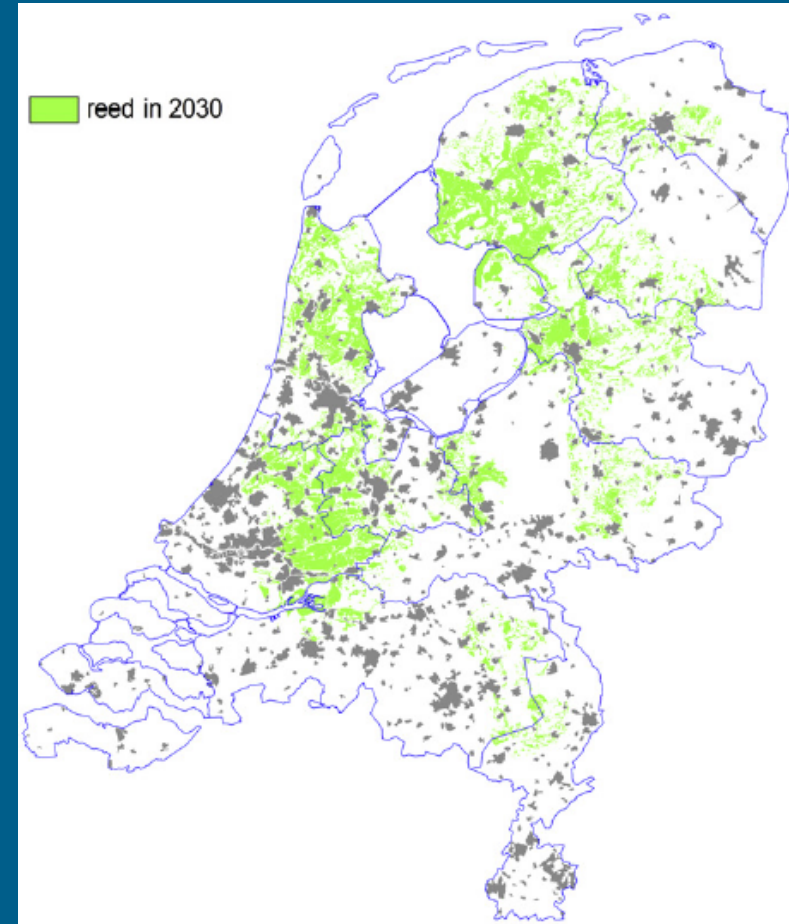


# Results

## Scenario 3: Biofuel policy



## Scenario 4: Soil protection and climate change adaptation



# Conclusions

- Reed cultivation for energy purposes not economically viable in the Netherlands under current conditions
- Only attractive if benefits from additional functions are also taken into account
  - Particularly in peat soils
- Future developments in terms of energy prices, climate change and policies may make reed more economically attractive
  - Combination of biofuel policies with environmental measures

# Conclusions

- Two systems of reed cultivation could be envisaged:
  - 1) Large-scale dedicated cultivation of reed in specialized farms
    - However, landscape issues should be taken into account
  - 2) Combination of livestock production and reed cultivation
    - Small-scale production of biogas through co-digestion of reed and manure



# Thank you

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