BIOMASS ON PEAT SOILS?
FEASIBILITY OF BIOENERGY PRODUCTION UNDER TWO SCENARIOS

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Why Reed (Phragmites australis) and Willow (Salix spp.)?

- Reed and willow are potential feedstocks for bioenergy. Their biomass can be processed either into cellulose-based ethanol or burned directly in order to generate electricity.
- Both are indigenous to the Netherlands, and do well under wet conditions. This makes them particularly suitable to the peat soils in low-lying areas.
- The land used for bioenergy crops can also be used for temporary water retention, either seasonally or as a reserve in case of calamity. The need for such areas is likely to increase as climate change progresses.
- This type of land use may offer nature benefits as well, although depending on how the land is managed (i.e. providing a wildlife habitat).
- Reed also purifies water.

In well-drained soils, reed can produce 112.9 GJ/ha and willow 40.3 GJ/ha in conversion to ethanol. Direct combustion of dry matter supplies higher energy values: 620.03 GJ/ha reed and 274.89 GJ/ha willow. If we assume an increase in productivity from 1% per year, the yield would be around 56% higher in 2050 (Fig.1 and 2).

In waterlogged soils, the yield will be around 1.8% less than yield in well-drained soils (Fig.3 and 4)

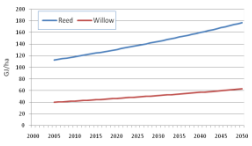


Fig.1: Biomass energy - conversion to ethanol in well-drained soils

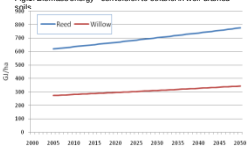


Fig.2: Biomass energy - direct combustion in well-drained soils

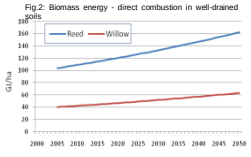


Fig.3: Biomass energy - conversion to ethanol in waterlogged soils

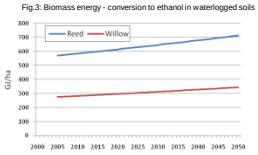
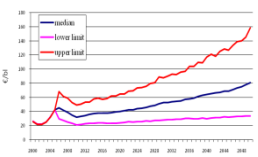


Fig.4: Biomass energy - direct combustion in waterlogged soils



Three projections for world market prices of crude oil, 2004- 2050. Source: PROMETHEUS.

Land used for biomass in the Netherlands in 2050 under the reference scenario (simulated with the Land Use Scanner model)

Reference scenario

- The medium prediction for oil price applies (€ 80/bl in 2050).
- Climate change is minor and
- Its effects on water levels are such as can be counteracted by higher dikes and bigger pumps.
- Agricultural markets are liberalized.
- High economic growth.
- Moderate demographic growth.

Biomass feasibility scenario

- The high prediction for oil price applies (€160/bl in 2050);
- Major impact of climate change: temperature rise and change in air circulation patterns;
- Combined with flood protection policies, this leads to higher groundwater tables in many areas and a greater need for surface water retention;
- Other factors as in reference scenario

Land used for biomass in the Netherlands in 2050 under the biomass feasibility scenario (modelled with the Land Use Scanner)

Costs of biomass production for ethanol in 2005 were €50/tonne. Accounting for technological advances in processing, we assume the cost to drop by 1% every year. Visually ethanol production based on reed will be commercially attractive if oil prices rise to levels such as seen in 2008 and is profitable in 20 years or so even with lower oil prices. (Fig.5 and 6).

Biomass production for direct combustion process offers more profit to farmers and not much dependent on a high oil price (Fig.7 and 8).

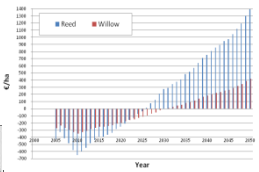


Fig.5: Net benefit of biomass conversion to ethanol

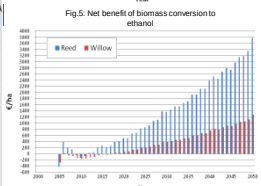


Fig.6: Net benefit of biomass conversion to ethanol

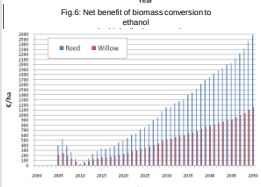


Fig.7: Net benefit of biomass conversion to combustion

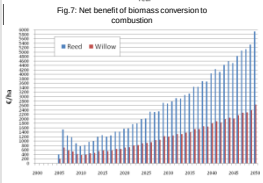
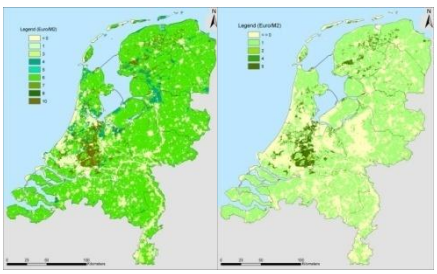
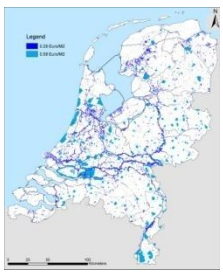
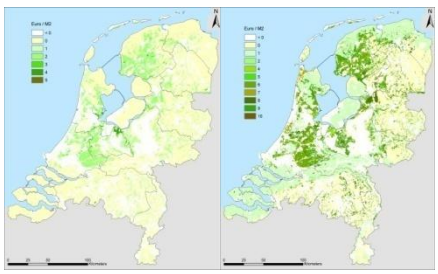


Fig.8: Net benefit of biomass conversion to combustion under high oil price scenario


Suitability maps for dairy production (2050): median oil price, normal GWT (left) and high oil price, high GWT (right)


Suitability map for water storage (2050)


Suitability maps for reed (2050): median oil price, normal GWT (left) and high oil price, high GWT (right)