Environmental Aspects of Bio-Energy Developments

DG ENV B1 Agriculture Forests and Soil

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The development of renewable energy is a central aim of the European Commission's energy policy for several reasons:

✓ Reducing Carbon Dioxide (CO_2) emissions – (EU commitment to reduce of 8% global GHG emissions by 2008-2012- Kyoto Protocol)

✓Improving the security of energy supply and reducing the Community's growing dependence on imported energy sources.

✓ Renewable energy expected to be economically competitive with conventional energy sources in the medium to long term.

EU policy targets for 2010

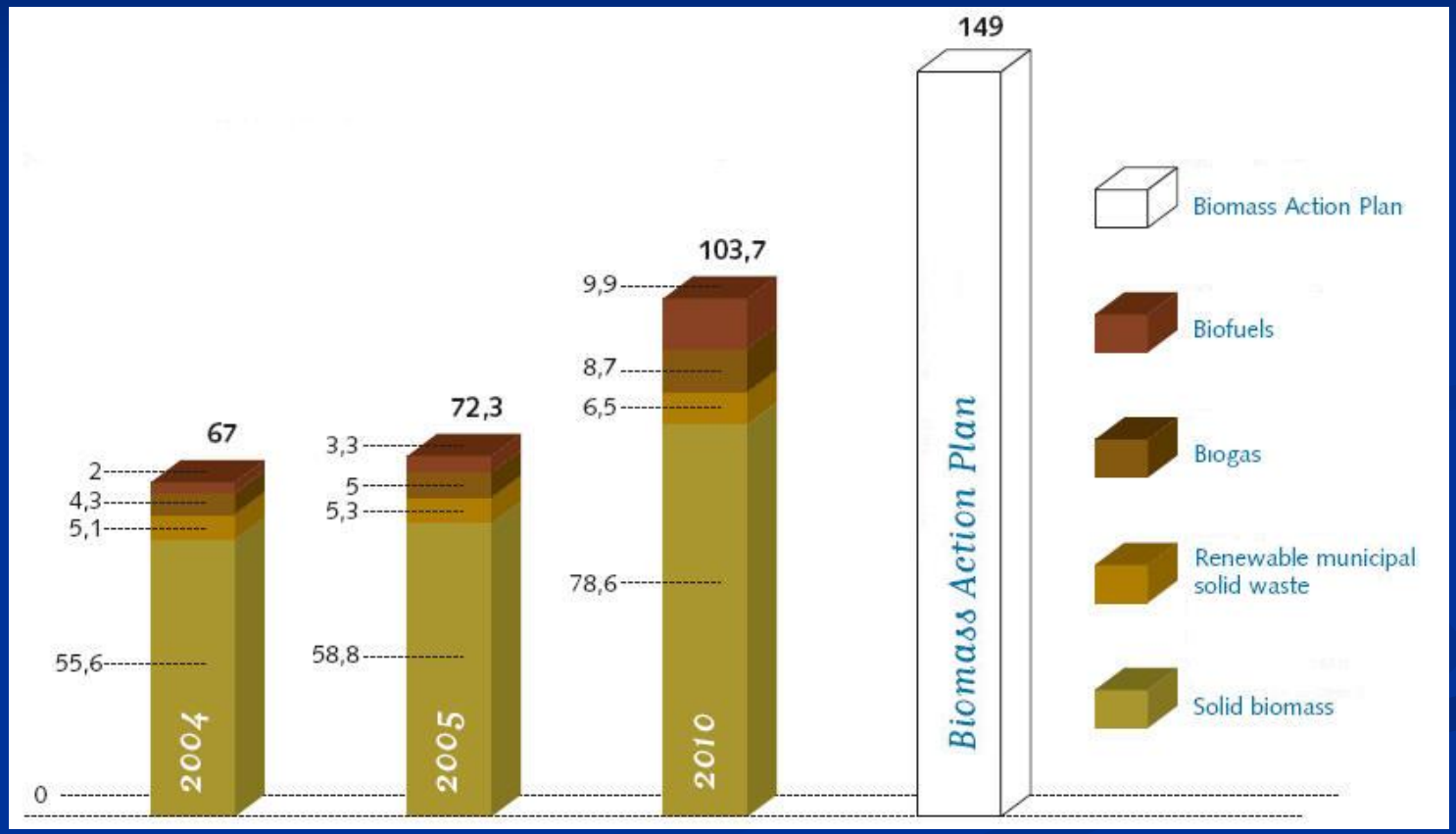
- 12 % renewable energy
- 21 % renewable electricity
- 5.75 % biofuel

Targets proposal for 2020

- 20 % renewable energy
- 10 % biofuel

The renewable energy at EU level: Biomass for bio-energy

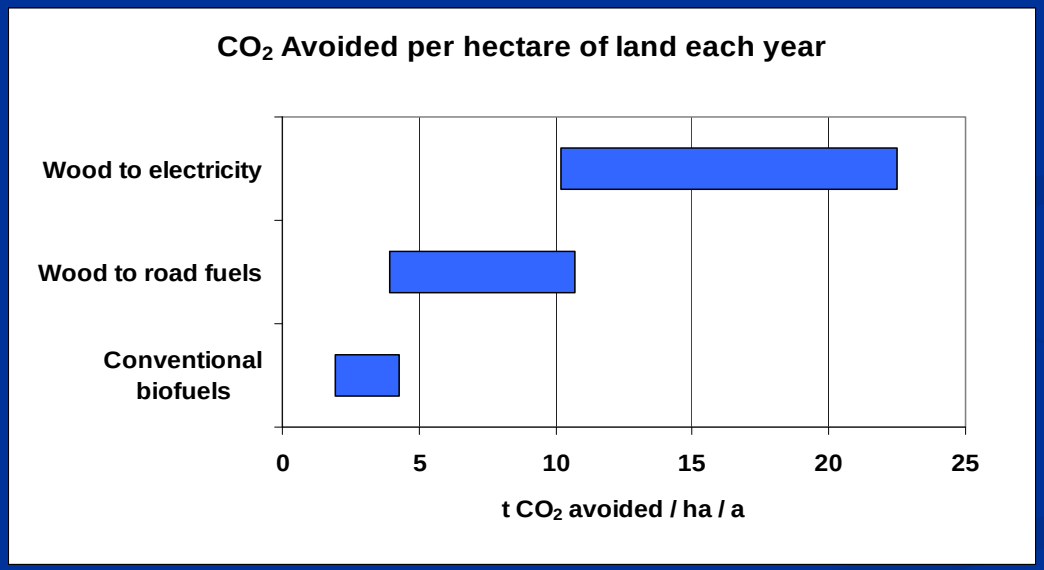
Comparison between the current trend and the Biomass Action Plan scenario (in Mtoe). EurObserv'ER 2006



GHG efficiency of Bio-energy Production

Three main bio-energy pathways:

1. Cellulosic biomass to heat and power ("direct biomass use")
2. Conventional crops to biofuel (1st generation biofuel)
3. Direct conversion of wood and fiber to biofuel (2nd generation biofuel – still experimental)



Source: JRC/EUCAR/CONCAWE "Well to Wheels Study"

✓ The use of wood for combined heat and power production provides the highest reduction of CO2 emissions.

✓ The lowest CO2 reduction is achieved by 1st generation biofuel.

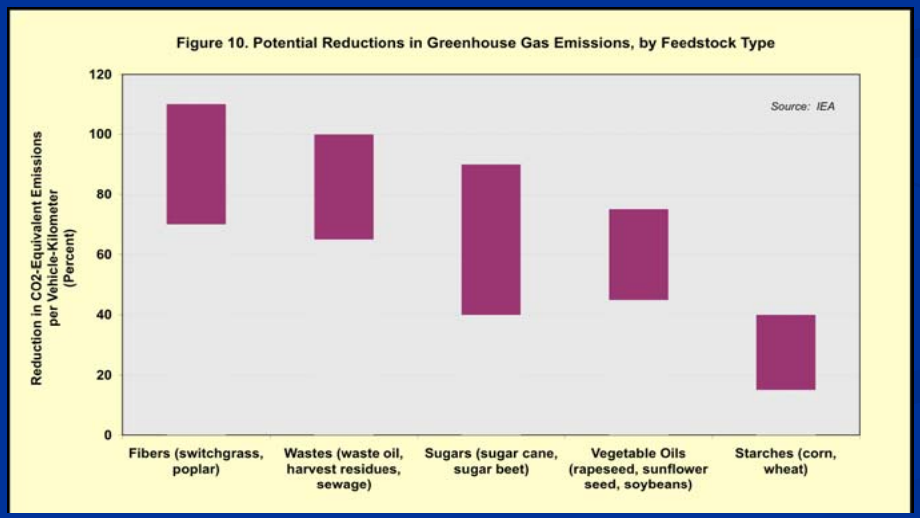
Biofuel: 1st generation vs. 2nd generation

Limitation of 1st generation biofuel technologies:

Rely on oil, sugar and starch crops (no by-products).
Annual crops usually have relatively high environmental impacts.
Low efficiency on GHG saving.

2nd generation biofuel technologies: more environmental-friendly biofuel

Can use low-impact, high yield crops (e.g. perennials).
Allows the use of the large bioenergy potential from forestry, waste, and by-products from agriculture.
Have low life cycle greenhouse gas emissions



✓ 2nd generation of biofuel provide a clearly better performance on GHG emissions saving per Km.

Environmental considerations:
Energy crops for 1st generation biofuel production

➢ **The environmental impacts depend largely on:**

- The area selected for bio-energy production.
- The crops cultivated.
- The farming practices.

➢ **The most probable effects are:**

- Competition with food production, possible effects on market prices.
- Further competition on land and water use with existing agricultural activities.
- Intensification of agricultural sector (increasing the use of input)
- Transformation of extensive used lands into arable land for growing bio-energy crops (many species in Europe depend on agricultural habitats and on the continuation of extensive farm management, particularly grasslands)
- Monocultures of bio-energy crops on an areas without respecting environmental pressures.

Environmental considerations:
Forest based biomass for bio-energy production

Facts:

- The rate of timber extraction in EU forests is in general lower than the increment in growing stock.

- Environmental functions of forest and forest residues are important (habitats for fauna, source of nutrients, regulation of water flows, etc.)

- BUT forest residues and deadwood can increase the risk of forest fires, particularly on areas where forests are not thinned due to lack of market demand and low prices.

The sustainable removal of forest biomass to produce bio-energy, can bring benefits by reducing forest fires risk and valorising forest by-products and residues.

Environmental considerations:
Forest based biomass for bio-energy production

Environmental safeguards have to be ensured:

- ❖ Leave in place a proportion of forest residues, foliage, old trees and deadwood.
- ❖ Never extract the roots.
- ❖ Respect local condition (slope, soil water regime, soil nutrient balance, etc.)

Conclusions

✓ Cellulosic biomass for heat and power production is the most efficient way for saving GHG.

✓ 1st generation of biofuel have a low performance on GHG saving.

✓ The extension of energy crops can be at the sources of serious environmental impacts on the biodiversity, water, soil, land use, landscape, etc.

✓ Energy crops can also have economic impacts (food prices, third country, etc.)

✓ 2nd generation of biofuel will allow a more environmental-friendly biofuel production.

✓ Making the potential available for transport requires 2nd generation biofuel Technologies.

In any case:

Environmental safeguards are needed to avoid that the increase in bio-energy production results in additional environmental pressures on agricultural and forest land, which are a scarce resource in Europe.