Ministry of Food,
Agriculture and Fisheries

Climate Perspectives

An optimal use of biomass for energy production will reduce emissions of CO_2 and other greenhouse gases. This will be accomplished by reduced utilisation of fossil energy, reduced methane and nitrous oxide emissions from manure and fertilizers and increased soil carbon storage from perennial crops, which all contribute to a positive impact on climate change

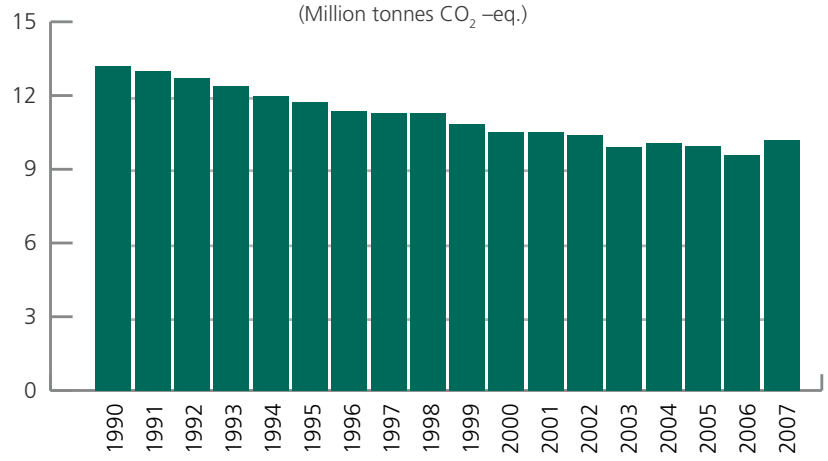
Emissions from agriculture in Denmark

The greenhouse gas emissions from agriculture in Denmark are 10 million tonnes CO_2-eq or 15 percent of Denmark's total emissions. Since 1990 there has been a decrease by 3 mio. tonnes CO_2 -eq. or 23 percent, primarily because of better efficiency in the feeding of livestock and better handling of fertilizers and animal manure. And more can be done.

50 percent manure for green energy

When the focus is on renewable energy a better utilization of animal manure is an obvious way to go. As a result, the Danish Government has in the Green Growth Plan from 2009 decided to create incentives for the agricultural sector to utilize up

Emissions of greenhouse gases from agriculture in Denmark 1990 - 2007



Source: Denmark's Fifth Communication on Climate Change

to 50 per cent of the animal manure for energy purposes in the run up to 2020. Today that figure is 4 per cent.

Other initiatives are tax relief and subsidies related to the growing of energy crops. In addition, further requirements for farmer's use of nitrogen fertilizers will add to the reduction of greenhouse gases from agriculture.

In total the initiatives in the Green Growth package will reduce the emissions from agriculture with further 800,000 tonnes CO_2 -eq. And if the replacement of fossil fuels is added the total reduction will be 1,200,000 tonnes.

Top ranked Green Energy

The Danish Ministry of Food, Agriculture and Fisheries has made an analysis of 15 different means to reduce greenhouse gas emissions. Three of the top rated instruments were related to bioenergy:

- Animal manure for biogas
- Cultivation of willow for energy purposes on marginal soils
- Straw to be utilized in energy plants.

The means were rated on their ability to reduce greenhouse gas emissions, their cost efficiency and whether the food production was affected. Positive side effects like reduced leaching of nitrogen and reduced use of pesticides were also factored in.

Instruments to reduce GHG emissions ranked according to cost efficiency DKK/ton CO_2-eq.

	Without carbon sequestration		With carbon sequestration	
	Economic costs (budgetary)	Welfare economic costs	Economic costs (budgetary)	Welfare economic costs
Animal manure for biogas	98	132	108	146
Energy crops (willow)	270	365	237	320
Straw used in energy plants	111	150	147	199
Nitrification inhibitors	1.429	1.929	1.427	1.929

Source: Landbrug og Klima, Fødevareministeriet 2008

The table above shows the three topranked instruments and their cost effectiveness compared to one instrument that is less cost effective.

Reducing adverse agricultural impact on the environment

Sustainable use of biomass for bio-energy production is expected not only to reduce emissions. It has also positive effects on pollution generated from the agricultural sector. For example, converting manure into biogas through bio-digesters can more than halve the emission of strong greenhouse gases and reducing organic matter in animal manure applied to the fields will reduce leaching of nitrate from vulnerable soils near aquatic environments.

By replacing annual crops with perennials such as miscanthus and willow, a positive impact on the environment is expected as reduced leaching of nitrate, reduced use of pesticides and more efficient carbon storage. The exploitation of residual products and by-products from the agricultural sector for bio-energy could also have negative climate impacts. An increased removal of straw from farm land and a reduced application of livestock manure may impact negatively on the soil carbon balance. Here catch crops can be part of a compensating solution. Catch crops in Danish crop production systems are used for diminishing the leakage of nitrogen.

In order to assess which technology is most optimal in transferring biomass into bio-energy, a thorough Lifecycle Analysis is required. This includes, among other things, the impact of carbon accounts. In connection to the Kyoto Protocol, Denmark is committed to include carbon changes in cultivated areas which are allowed according to the protocol. The inclusion or exclusion of carbon may have crucial implications on whether the exploitation of biomass in various technologies contributes positively or negatively to the greenhouse gas accounts.

April 2010

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