

# Critical views on biofuels for aviation

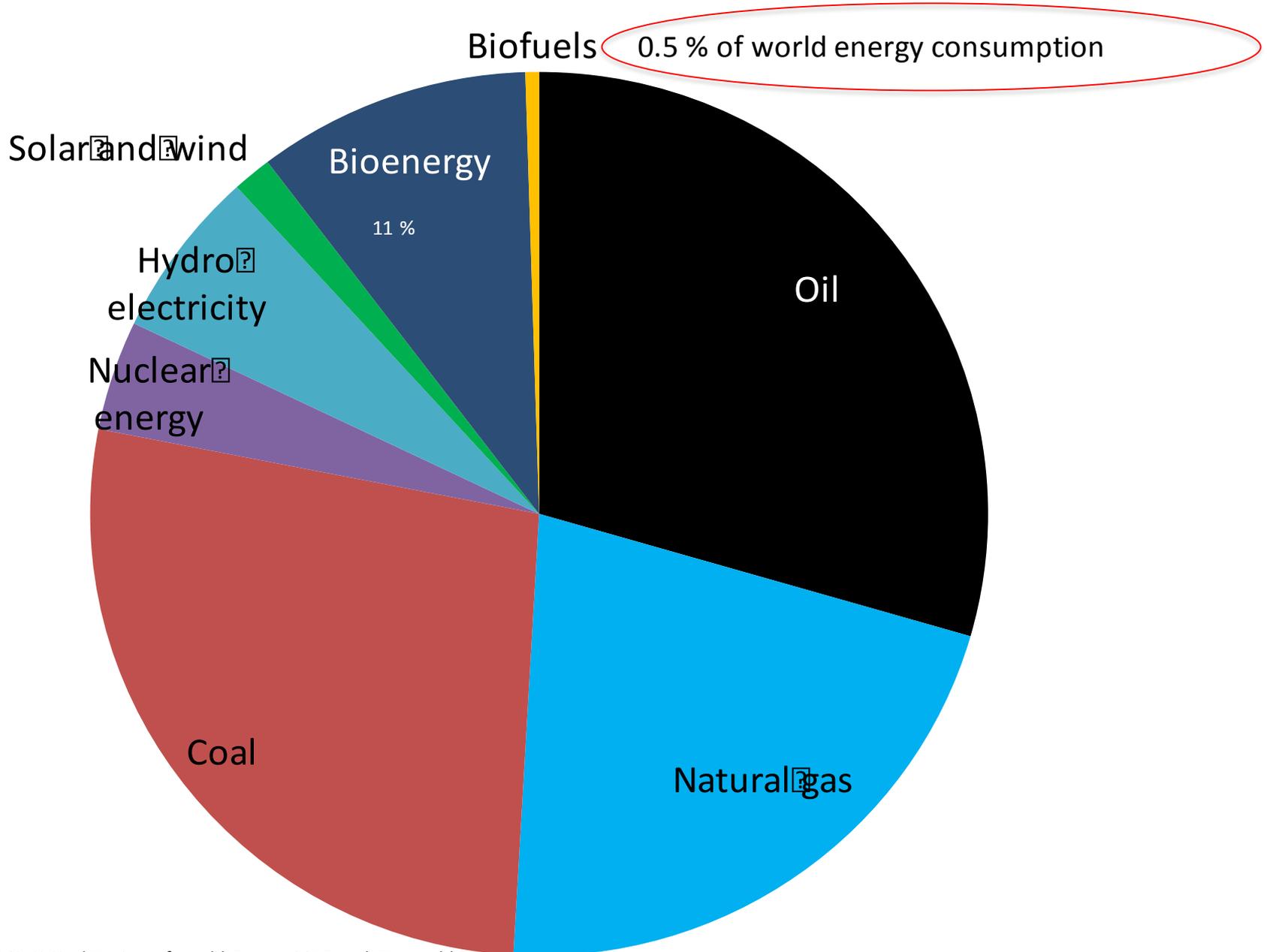
Bjart Holtsmark  
*Statistics Norway*

*at*

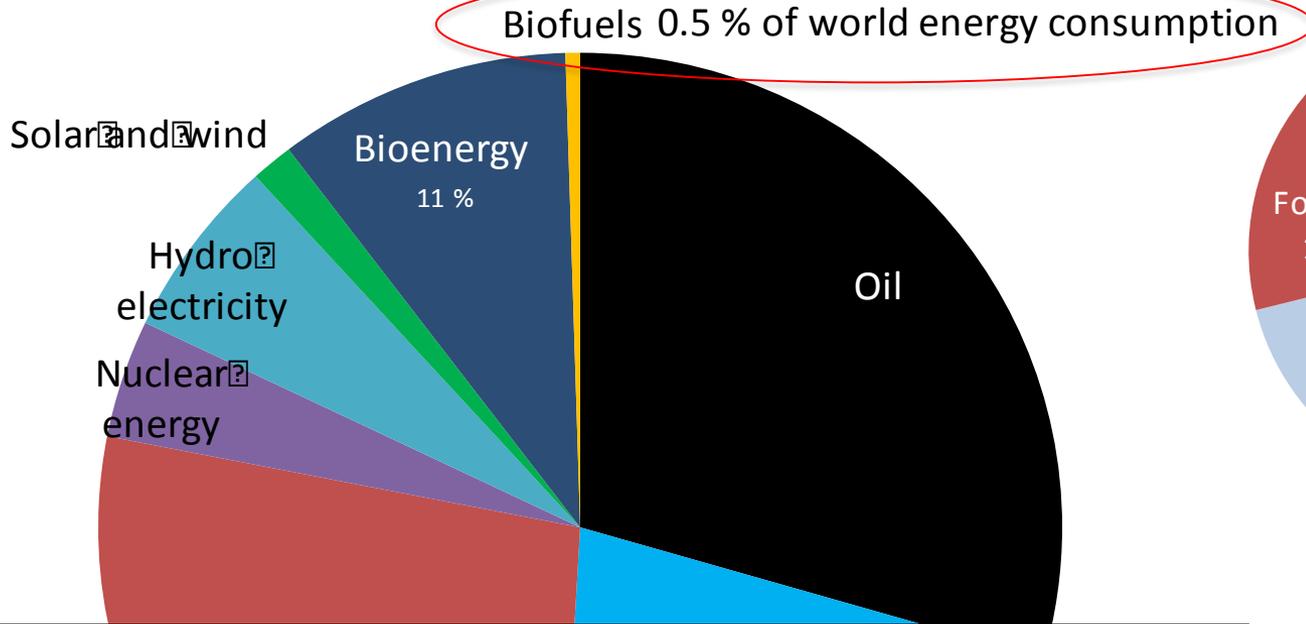
Seminar by the Nordic Council of Ministers  
Oslo

1<sup>st</sup> September 2016

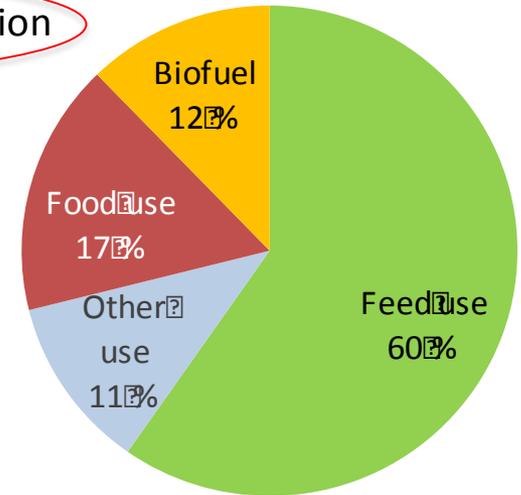
# World primary energy consumption 2014



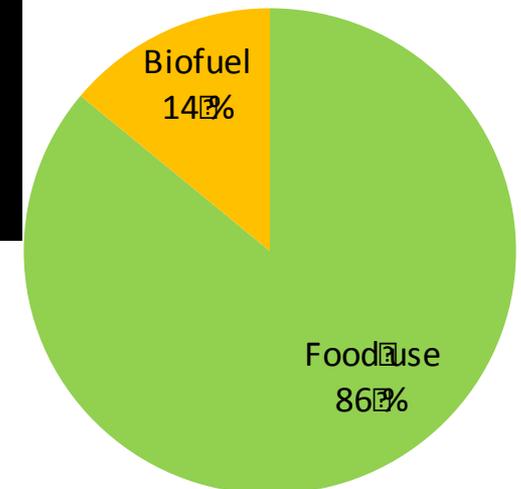
# World primary energy consumption 2014



## Coarse grains



## Vegetable oils



Expanding of the foodcrop based biofuels production will be very land demanding

Source: BP Statistical Review of World Energy 2015 and IEA World Energy Outlook 2014 (bioenergy)

Source: OECD-FAO Agricultural Outlook 2015

# The basic facts and questions:

OECD-FAO Agricultural Outlook 2015:

*Food-crop based feedstocks are expected to continue to dominate the biofuels market over the coming decade*

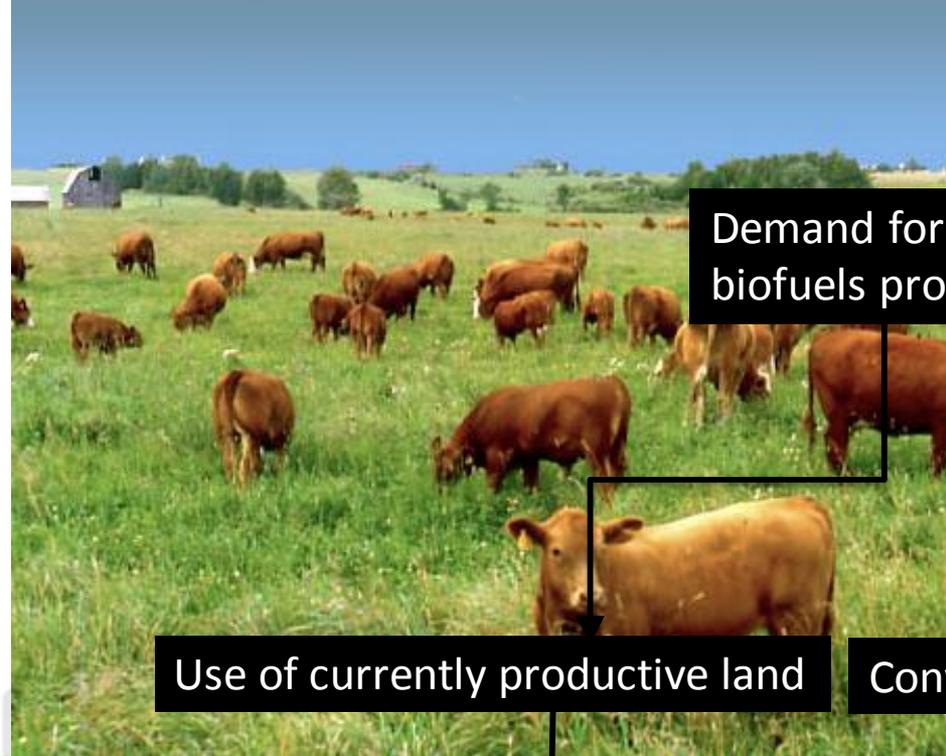
- Population growth
  - Income effects
- } Growing demand for food (and land)

Consequences:

- Deforestation
- Reduced biodiversity

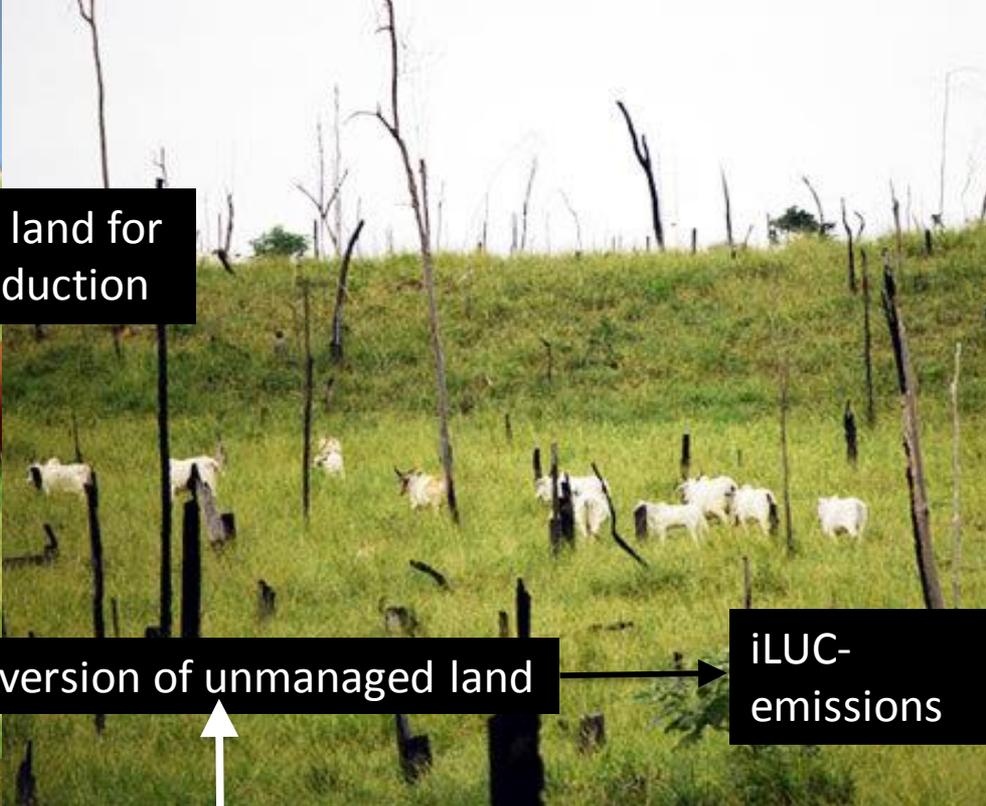
What are the effects of massive land use for biofuels in this situation?

**Recall: The world economy is not a "command and control" economy – it is a market economy – with limited possibilities for controlling where biofuels production will take place**



Demand for land for biofuels production

Use of currently productive land

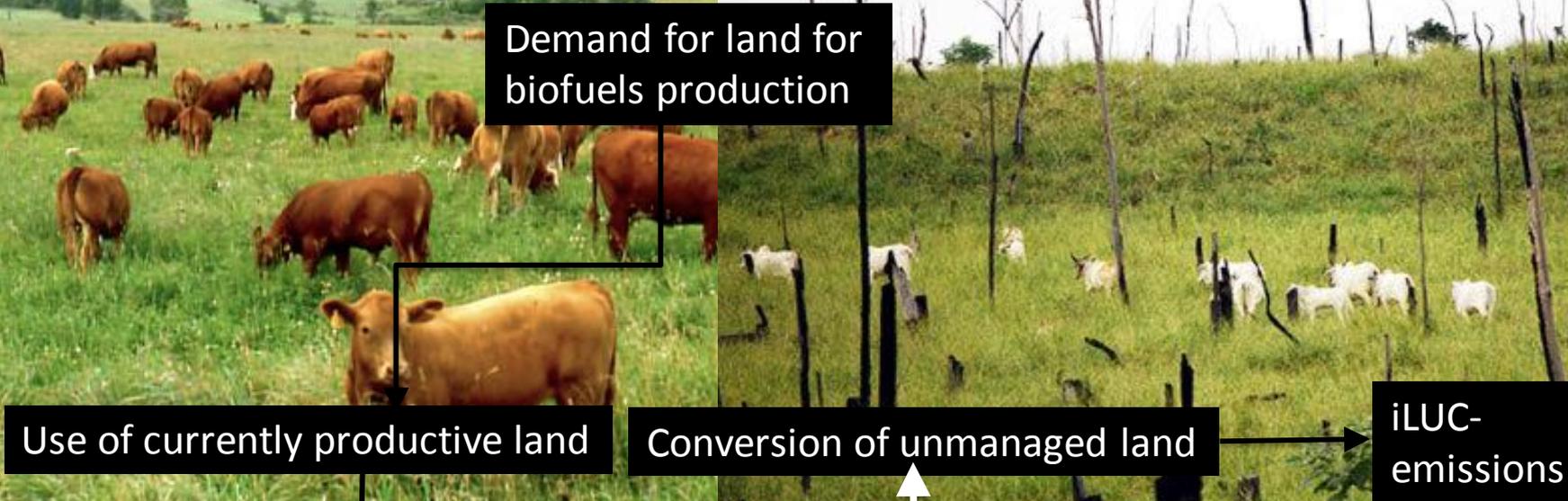


Conversion of unmanaged land

iLUC-emissions



Increased demand for land for food production





Malaysia

South China Sea

Singapore

Sumatra

Photo: NASA, June 19, 2013

100 km

# Recent literature on iLUC

- Barona et al (2010). The role of pasture and soybean in deforestation of the Brazilian Amazon. *Environmental Research Letters*, 5(2)
- Lapola et al. (2010). Indirect land-use changes can overcome carbon savings from biofuels in Brazil. *Proceedings of the National Academy of Sciences*, 107(8)
- Busch et al. (2015). Reductions in emissions from deforestation from Indonesia's moratorium on new oil palm, timber, and logging concessions. *Proceedings of the National Academy of Sciences*, 112(5), 1328-1333.
- Searchinger et al. (2008). Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change. *Science*, 319(5867), 1238-1240.
- Chakravorty, Hubert, Moreaux, & Nøstbakken, Linda (2015). The Long-Run Impact of Biofuels on Food Prices *RFF Discussion Paper* (Vol. 15)
- O'Connell, J. (2012). "Biofuels may actually increase aggregate world carbon emissions, due to carbon leakage (...) and conversion of pasture and forest land for farming." *biofuel* 248-257
- Laborde, D., & Valin, H. (2012). Modeling land-use changes in a global CGE: Assessing the EU biofuel mandates with the MIRAGE-BioF model. *Climate Change Economics*, 03(03)

## Biofuels for aviation from Nordic forests:

2 billion liters by 2050

= approximately 20 million m<sup>3</sup> wood

= 2 x annual Norwegian harvest

- Will lead to a harvesting level higher than in a BAU case
- Makes my own research relevant
- 8 articles in scientific journals

# Net change in accumulated emissions of carbon to the atmosphere if bioenergy replaces fossil fuels

