

# State of Food and Agriculture 2008

## Bioenergy: Can it fuel a rural renaissance?

Keith Wiebe, FAO  
6 February 2008

# The State of Food and Agriculture

- 2003-04 Biotechnology
- 2005 Trade
- 2006 Food Aid
- 2007 Environmental Services
- 2008 Bioenergy

# SOFA 2008

- Terri Raney and Jeff Tschirley are co-editors
- contributions from FAO's IDWG on Bioenergy
- insights from BEFS
- input from expert meetings on biofuels
- coordinated by the Agricultural Development Economics Division (ESA)

# Technical overview

## ■ bioenergy

- feed and fodder for animal power
- wood for heating and cooking
- biogas etc.

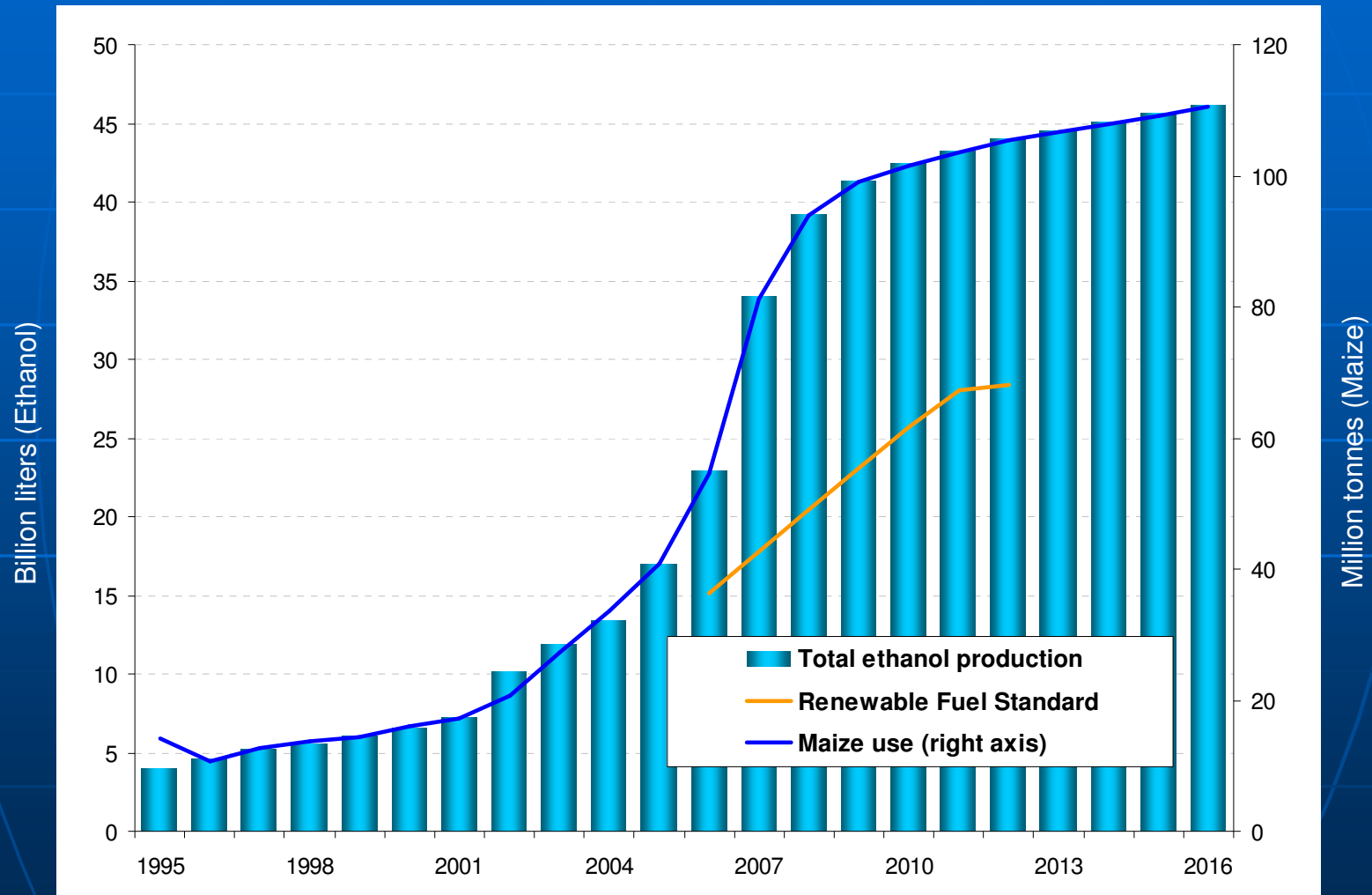
## ■ liquid biofuels

- bioethanol from sugar and maize
- biodiesel from palm oil and rapeseed
- 2<sup>nd</sup>-generation biofuels

# Policy drivers

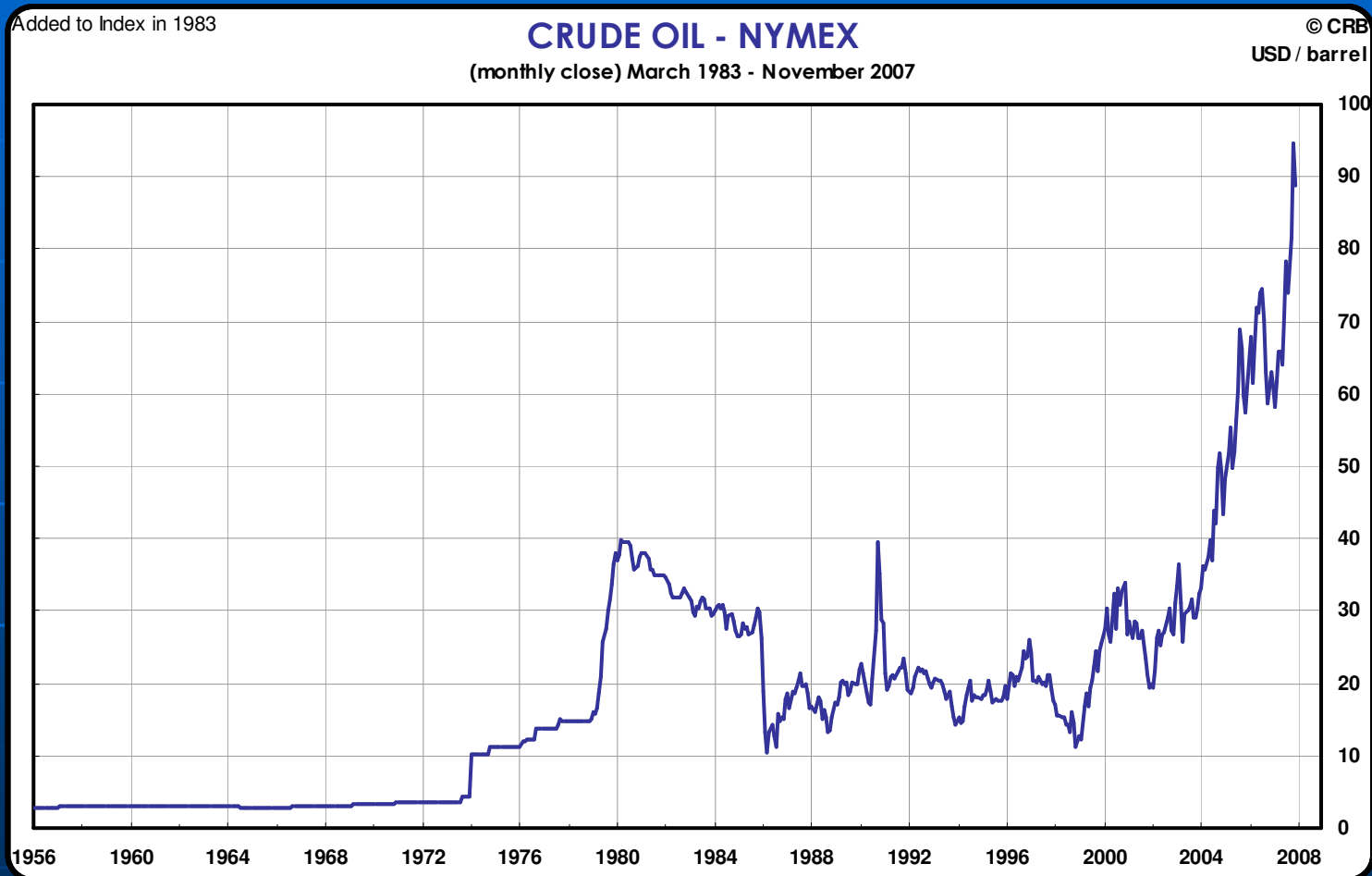
- **motivations**
  - energy security
  - climate change mitigation
  - rural development
- **but most biofuels not commercially viable**
- **thus policy instruments**
  - blending requirements, subsidies, tax incentives, tariffs

# Ethanol production in the US



Source: USDA/ERS in OECD-FAO Agricultural Outlook 2007-2016

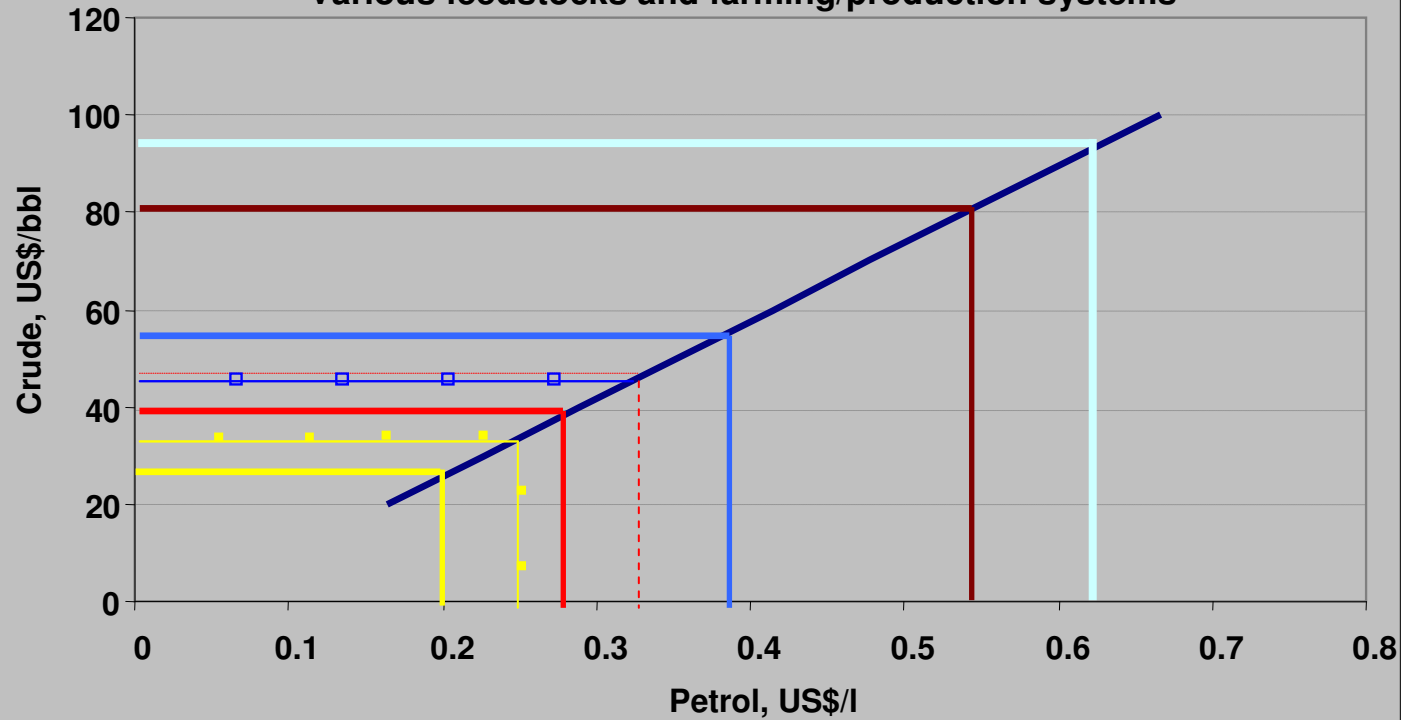
# Crude oil prices, 1956-2007



Source: <http://www.crbtrader.com/crbindex/>, accessed 31 Dec 07

# Parity prices: Petrol – Crude oil – Ethanol

Various feedstocks and farming/production systems



- Gasoline-Crude US\$
- Cane, Brazil, average
- Cane Brazil, top producers
- Cassava, Thailand, OTC joint venture
- Cassava, Thailand, 2 mio l/d
- Maize, US
- Palmoil, MPOB project
- Mixed feedstock Europe
- BTL: Synfuel/Sunfuel

Josef Schmidhuber (2005)

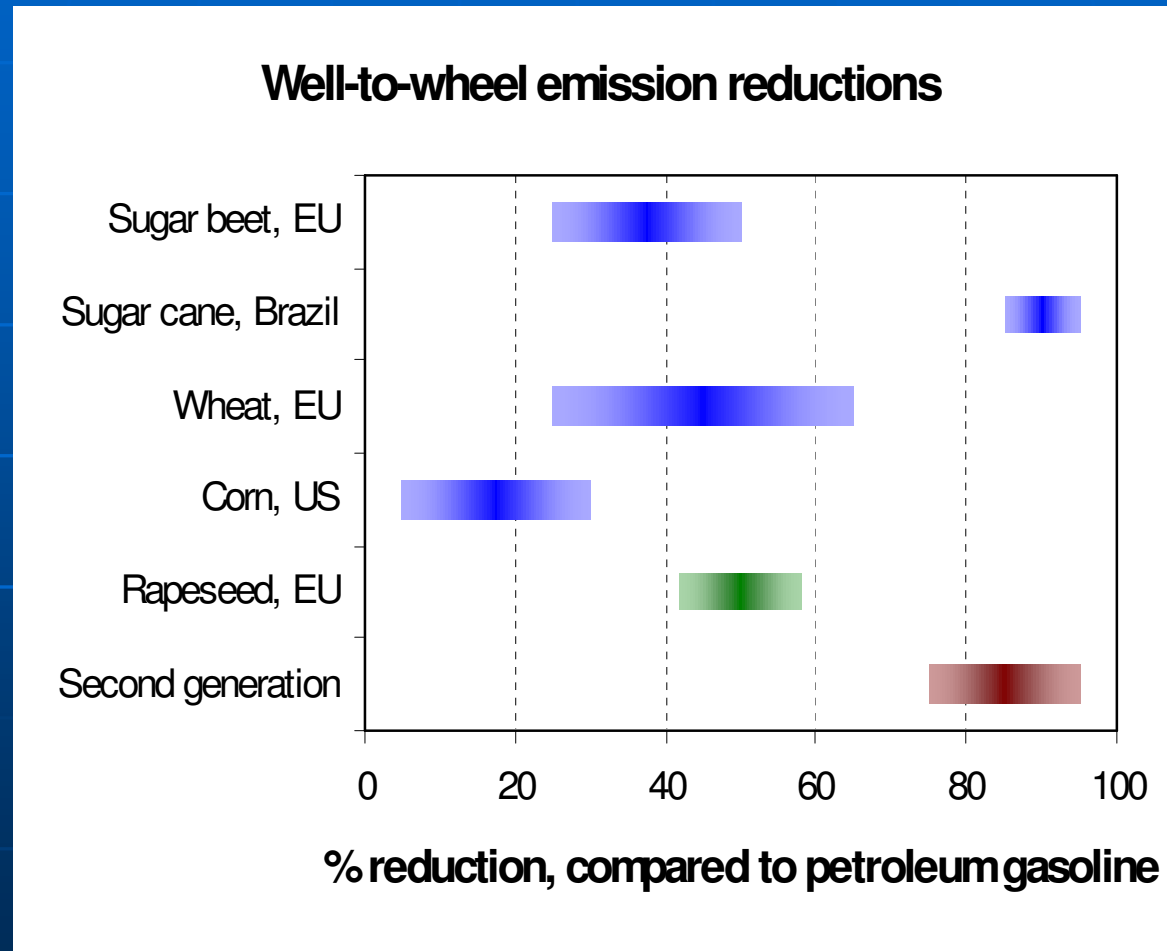
# Economics of biofuels

- small share of energy, but larger share of agriculture, resources
- impacts on commodity prices
  - price floor and price ceiling
- concerns about food security
  - shift between uses (but non-food use not new)
- supply response
  - area expansion
  - yield increase
- concerns about the environment

# Environmental impacts

- **climate change mitigation**
  - life-cycle analysis
  - carbon balances by fuel, feedstock, region
- **impacts of cropland expansion**
  - land, water, biodiversity
  - set-aside, CRP, forest land, protected areas
- **impacts of intensification**
- **will 2<sup>nd</sup>-generation technologies be different?**

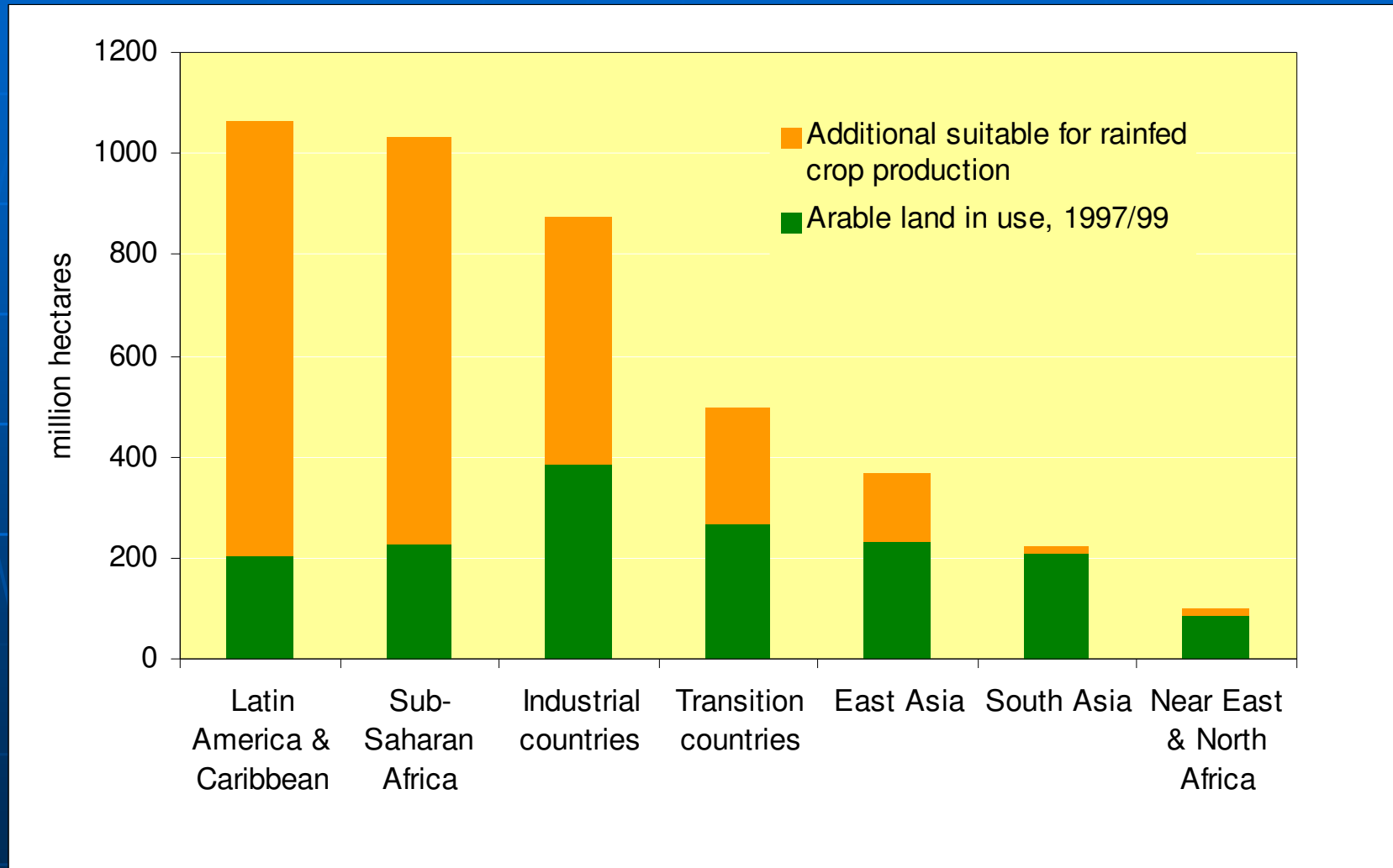
# Indicative range of potential GHG abatement from biofuels



**Wide ranges are due to varying LCA assumptions and methodologies**

Source: IEA

# Potential for area expansion



Source: FAO

# Potential for cropland expansion

## WHERE BIOFUEL CROPS COULD GROW

When all factors are taken into account there is little land left suitable for biofuels

Proportion of land not under cultivation or built-up



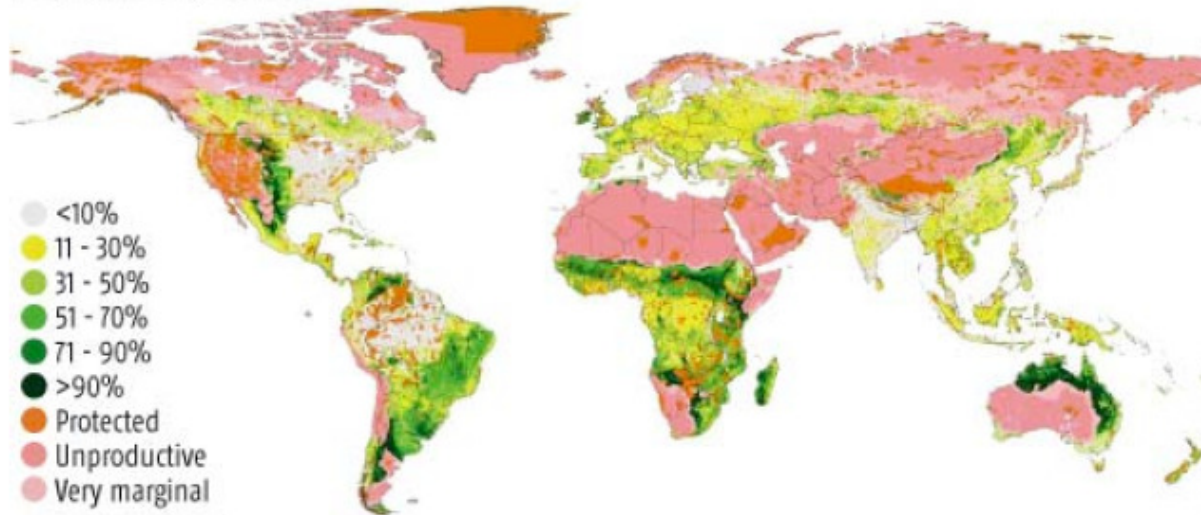
- <10%
- 11 - 30%
- 31 - 50%
- 51 - 70%
- 71 - 90%
- >90%

...after subtracting forests, deserts and other non-vegetated areas



- <10%
- 11 - 30%
- 31 - 50%
- 51 - 70%
- 71 - 90%
- >90%

...and then subtracting mountains and areas that are protected, or too marginal or climatically unsuitable for agriculture



- <10%
- 11 - 30%
- 31 - 50%
- 51 - 70%
- 71 - 90%
- >90%
- Protected
- Unproductive
- Very marginal

SOURCE: S. NILSSON, IIASA

<http://environment.newscientist.com/data/images/archive/2634/26343801.jpg>

Source: Pearce & Aldous 2007, based on IIASA

# Dimensions of food security

- **availability**

- global, national, local, household

- **access**

- national, local, household, individual
- prices, income, wealth

- **utilization**

- clean water, sanitation, health

- **stability**

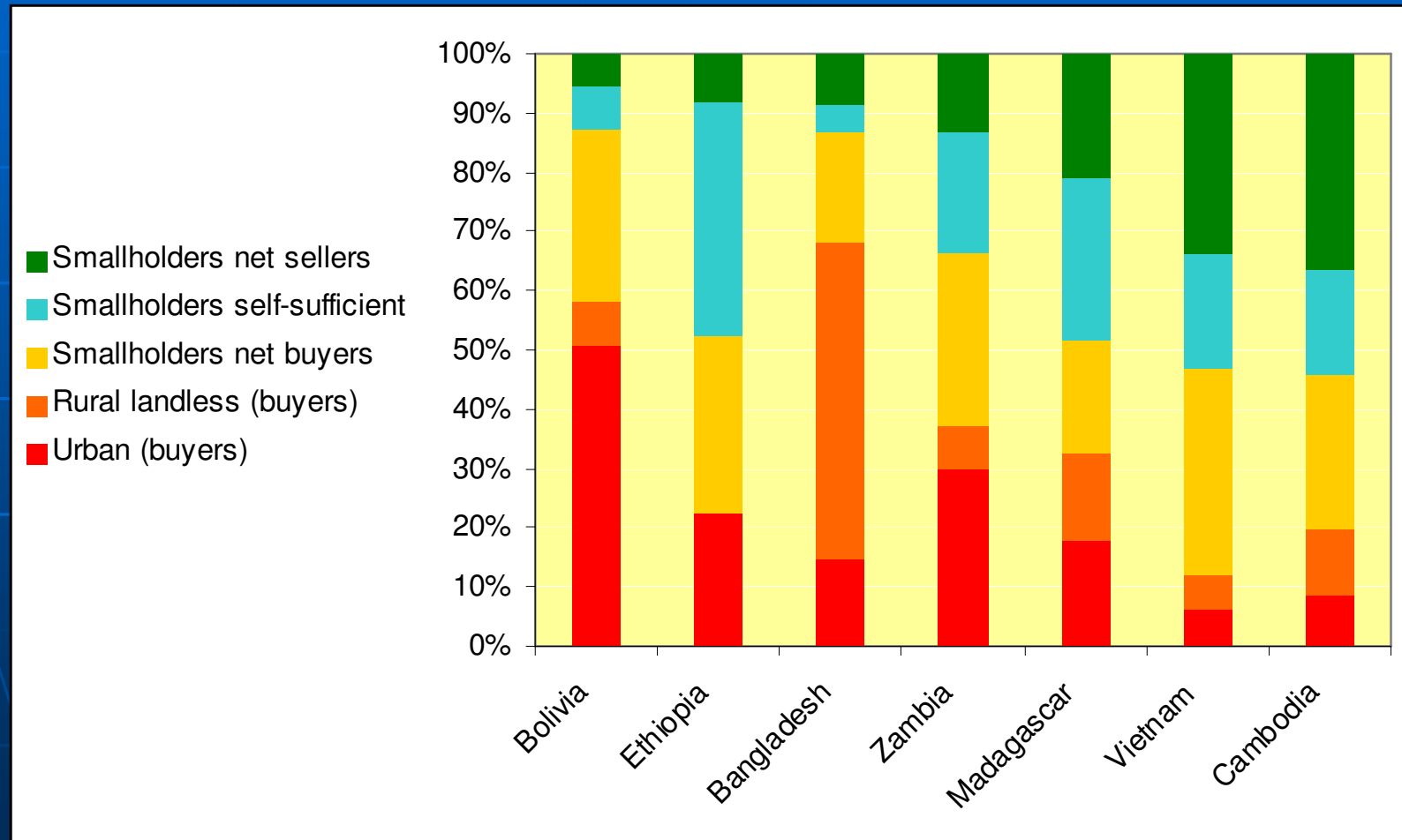
- variability in any of the above, coping capacity

# Food security--availability

- currently, about 1% of the world's arable land is used for liquid biofuel production
- 3-4% arable land could be used for biofuels by 2030
- half of Brazil's sugar, 20-30% of US maize used for ethanol
- more food crops produced...
- ...but net reduction in food availability for direct human consumption

# Net buyers and sellers of food staples

percentage of poor population buying or selling internationally traded staples (rice, wheat, maize, beans)



Source: World Bank 2007

# Food security--access

- **prices**
  - gains for net sellers
  - losses for net buyers
- **income from wages & employment**
  - scale of production matters (for both feedstocks & biofuels)
  - 1<sup>st</sup> & 2<sup>nd</sup> generation technologies
- **wealth**
  - rising land values
  - importance of secure land tenure
- **net effect will vary widely**

# Food security--utilization

- biofuels could make water less readily available for household use
- on the other hand, modern bioenergy could make cooking both cheaper and cleaner
- net effect unclear

# Food security--**stability**

- crude oil prices historically twice as variable as maize prices
- closer links between energy and agricultural commodity prices
- result: variability in wheat, maize and oilseed prices has doubled over the past 5 years

# Questions for BEFS

- net buyers and net sellers
- employment impacts of different technologies
- impacts on access to resources
- how much added value goes to small producers?
- who controls the increased income within the household?
- what investments are needed in institutional and physical infrastructure?

# Other key questions

- food price impacts in the context of other supply and demand factors
- climate impacts
- other resource impacts
- trade barriers
- role of international guidelines and standards

# Lessons

- are high prices better than low prices?
- need to weigh benefits against costs, winners vs losers at individual, household and national levels
- highlights existing challenges, e.g. need for improved productivity, information, infrastructure, property rights, technology, credit, and ability to manage uncertainty

...watch for the  
*State of Food and Agriculture 2008*  
in November