Can biofuels make a significant contribution to sustainable energy supply?

– Agriculture, Food Security –

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Based to a large extent on discussions with and work of Josef Schmidhuber, Senior Economist, FAO, and a number of other colleagues at FAO and at the Copernicus Institute, Utrecht.

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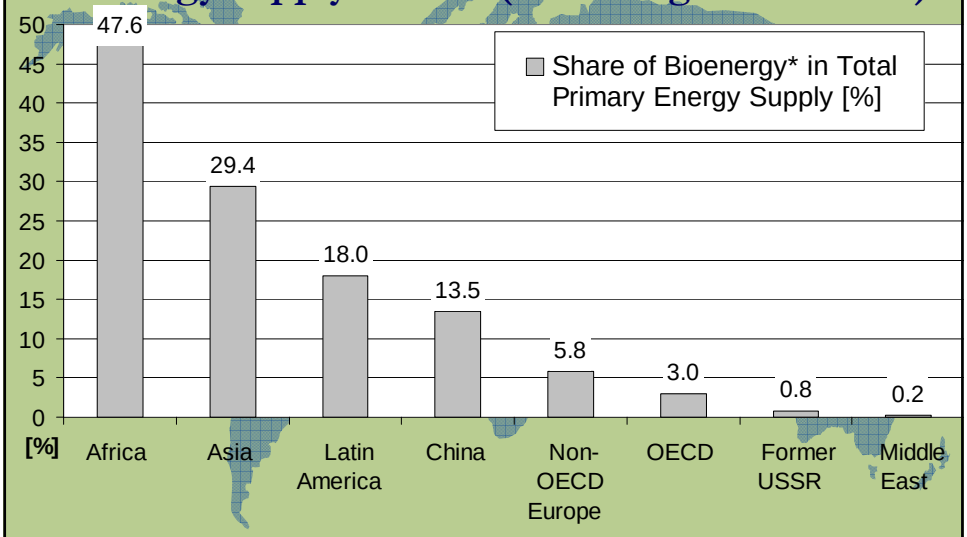
Outline

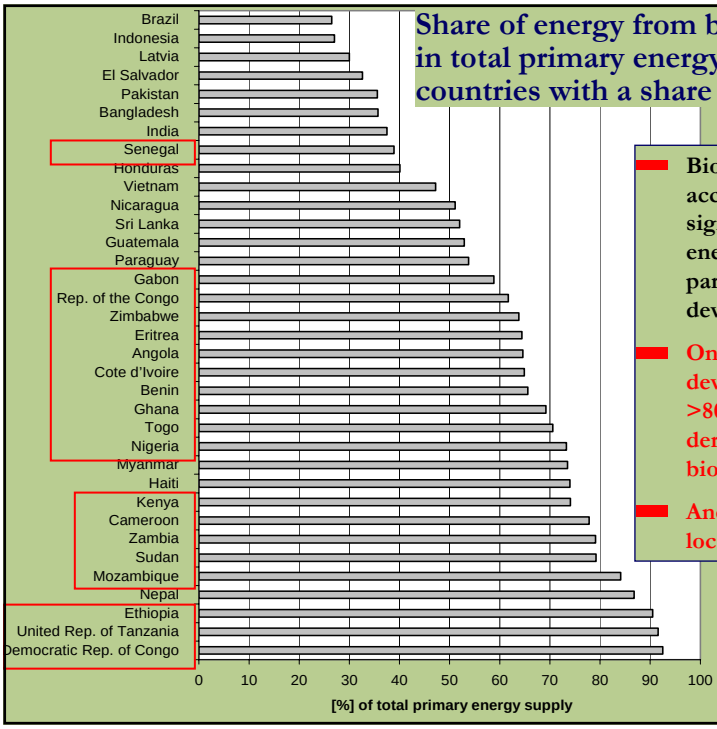
1. The scope for bioenergy development – global trends
2. Implications for Agriculture and Food Security
3. Conclusions - Outlook – Way Forward

Bioenergy supply in 2004 (according to IEA 2006)



Ingmar Juergens, Climate Change and Bioenergy Unit, FAO

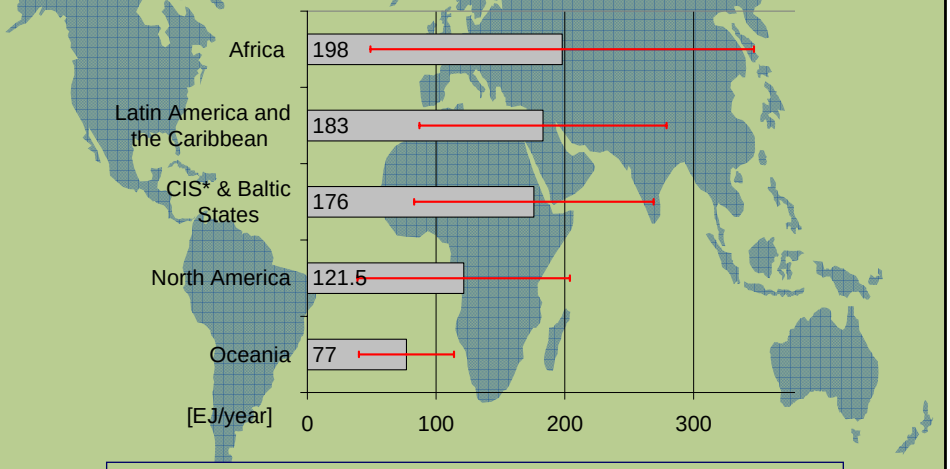
Share of energy from biomass and waste in total primary energy supply for countries with a share of 30% and above



- Bioenergy currently accounts for a significant share of total energy supply, particularly in the developing world
- On aggregate, in developing countries, >80% of energy is derived from traditional bioenergy systems
- And the bulk of it is located in Africa

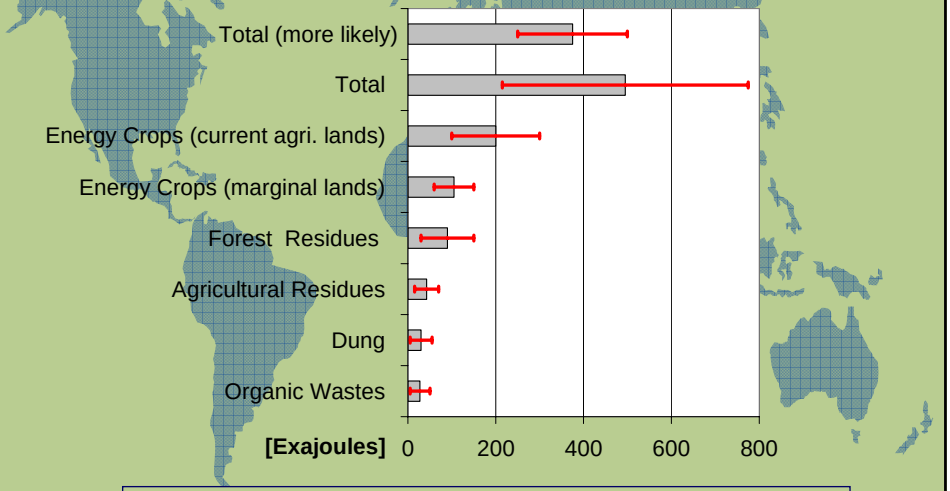
Source: Juergens (FAO) 2006 based on data from IEA 2006

Bioenergy potential per region: different scenarios, year 2050 Exajoules/yr



Source: Juergens and Mueller *forthcoming 2007,* based on data from WWI 2006)

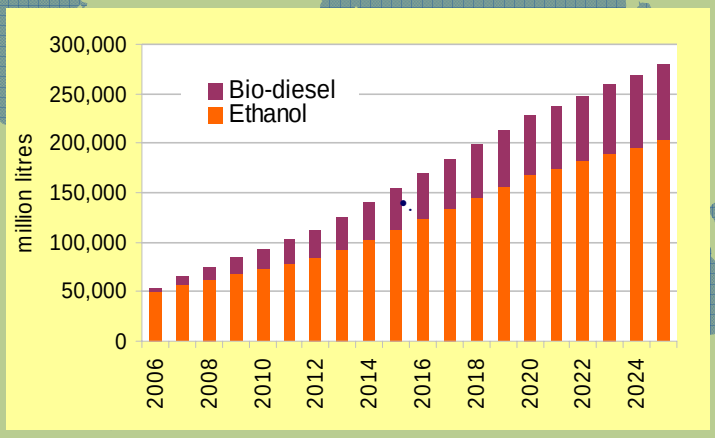
Bioenergy potential per type of biomass: different scenarios, year 2050 Exajoules/yr



Source: Juergens and Mueller *forthcoming 2007,* based on data from Faaij 2006

Global bio-fuel production could expand 5-fold by 2025

- Sustained high prices of crude oil projected provide an additional incentive to expand bio-fuel output – beyond the levels stipulated by policy – as long as retail excise tax relief for bio-fuels remains

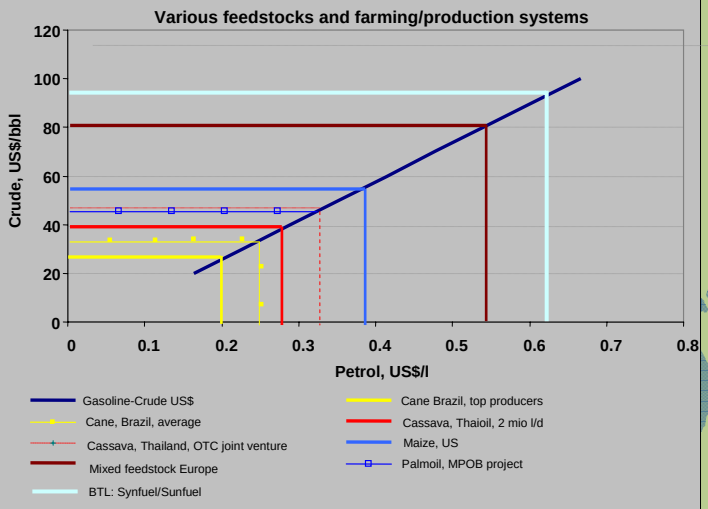


Source: Adam Prakash, EST, FAO

Implications for Agriculture and Food Security

Competitiveness by feedstock

Parity prices: Petrol–Crude oil – Ethanol



Josef Schmidhuber (2005)

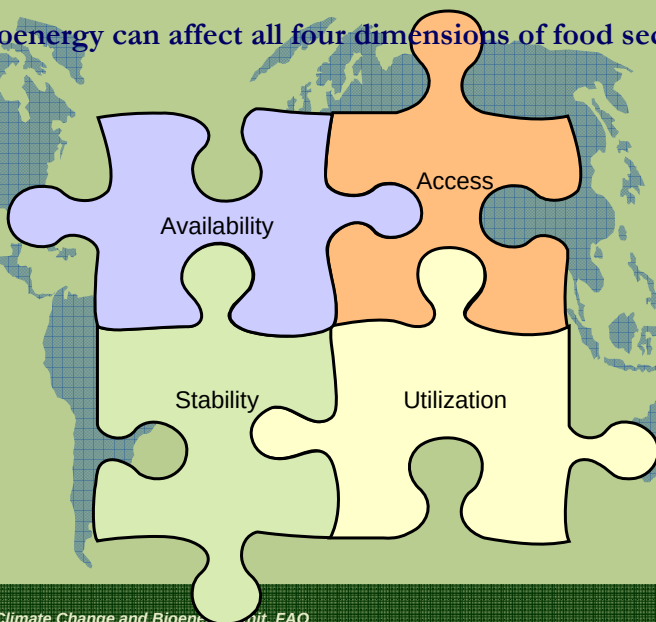
Cross links: Impacts on international commodity prices

	An additional 10 million tonnes of …				
	Sugar	Maize	Sugar and Maize	Soybeans and Maize	Sugar, Maize and Soybeans
Corresponding energy [biofuels]	0.195 EJ	0.087 EJ	0.282 EJ	0.167 EJ	0.349 EJ
Commodity	… used for biofuels would change international prices (percent) in the long-run by :				
Sugar	+9.8	+1.1	+11.3	+2.3	+13.8
Maize	+0.4	+2.8	+3.4	+4.0	+4.2
Vegetable oils	+0.3	+0.2	+0.2	+7.6	+7.8
Protein	+0.4	-1.2	-1.2	-8.1	-7.6
Wheat	+0.4	+0.6	+0.9	+1.8	+2.0
Rice	+0.5	+1.0	+1.2	+1.1	+1.4
Beef	+0.0	+0.2	+0.2	+0.4	+0.4
Poultry	+0.0	-0.4	-0.4	-2.1	-2.0

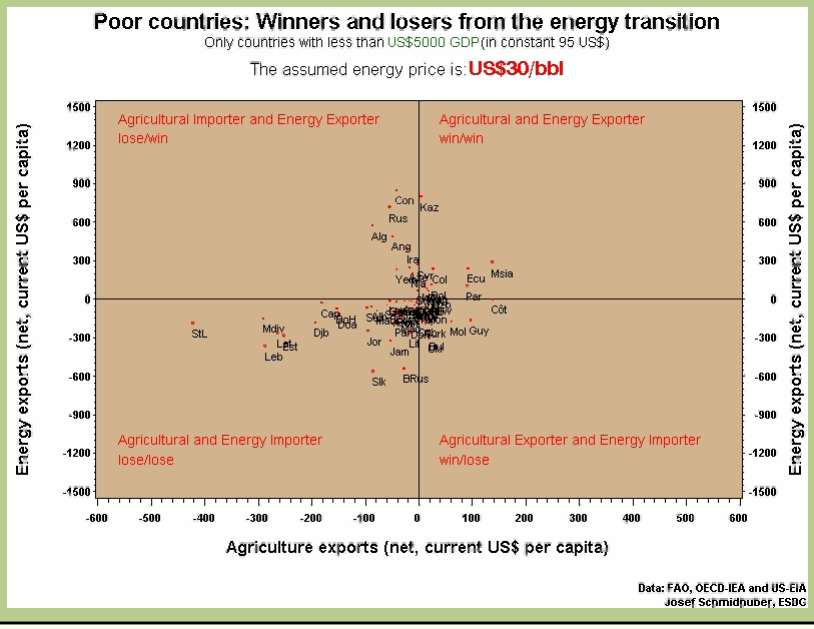
Source: Schmidhuber @2030 simulation results

Impacts on Food Security

Bioenergy can affect all four dimensions of food security



International food security: Boom or bust for trade balances through an increased link between energy and food prices



Summary

Energy vs. Agricultural Markets

- Energy markets >>> agricultural markets → create (perfectly) elastic demand for competitive agricultural produce.
- Energy markets *drive* agricultural markets but not vice versa.

Price and market effects

- Rising fossil fuel prices → some agricultural feedstocks competitive energy feedstock; demand from the energy sector has created a ***floor price*** for agricultural produce;
- The price links between agriculture and energy markets rises with rising energy prices, as more feedstocks become competitive energy sources.
- Paradigm shift possible with an end to falling real prices, but neo-Malthusian scenarios are unwarranted: agricultural prices will not rise faster than energy prices. → ***Ceiling price*** effect
- Not all commodities are affected in the same way and to the same extent:
  - Protein/energy differential
  - Differences for the same feedstock across countries (sugar from Brazil to Japan)
  - Differences for the same country across feedstocks (Thailand cassava vs. sugar vs. palm oil)

Current and emerging issues

- **Rising real prices: boom for agriculture, rural areas, resources flow back to the sector, including research and private sector investment.**
- **Overall commodity boom: higher growth in many commodity-dependent economies (Africa!)**
- **Bust after the boom? Agricultural boom driven by feedstocks for the first generation, which are agricultural commodities. Their conversion is rather inefficient, the environmental benefits are limited.**
  - ➔ are current policy incentives right?
  - ➔ do we (again) create a "fallacy of composition" problem with over- investments in first generation bioenergy?
  - ➔ do we create a new commodity bubble with debt and investment hangover as in the 1970s?

cont. current and emerging issues

- **Impacts on food security are still unclear. Existing country-level assessments need to be supplemented by household based analysis.**

  Preliminary results:
  - ➔ country level: net imports of food and energy = extra burden, lose-lose situation. Net exporters of food and energy: win-win situation
  - ➔ HH level: urban households to suffer, as well as resource poor rural households.
  - ➔ Which business models and policies can help
    - mitigate the adverse impacts on the poor (urban and rural),
    - harness the benefits of bioenergy for the majority of the poor beneficiaries (co-operatives, bundling capital and know-how, access to resources, ...)
- **More quantitative analysis is needed to be able to support policy makers taking the right policy decisions. Our goal: help policy makers make informed policy decisions.**

Conclusions

- Large potential for bioenergy in developing countries; as energy source, bioenergy is becoming increasingly competitive
- Differential impacts across commodity markets and countries (Schmidhuber 2006):
  - winners and losers;
  - agricultural renaissance vs. food security concerns;
- Externalities can be significant: large potential benefits but opportunity costs regarding land use of large scale projects are of concern
- The delivery of SD co-benefits is not automatic. It would be strengthened by an institutionalization of externalities valuation in the Energy market.
- Existing analysis has overemphasized the role of food production at the expense of the other dimensions of food security
- Food security and bioenergy systems are characterized by very complex interactions between the macro and micro level

Need for further analysis and research

- Assessments of Bioenergy Potentials need to
  → include sustainability; treat prices endogenously
- What impacts on land prices, rents, the environment, biodiversity, etc.?
- What impacts on economic development and the traditional development paradigm? Will the ever excluded benefit? Pro-poor?
- What are adequate policy frameworks, institutional settings, etc?
- Partial Equilibrium Models (agriculture), Energy Models, Global Land Use Models, Integrated Assessment Models
  → Improve linkages between different modeling arenas
- Recognize diversity in biomass production and supply systems; not only agricultural land & food crops/not only liquid biofuels
- Careful, local/national analysis is required to qualify the different determinants of the food security and bioenergy nexus

With inputs from Josef Schmidhuber (2006)

Outlook and next steps

- International Bioenergy Platform (IBEP) facilitated by FAO
  → framework for knowledge management, analysis and implementation of sustainable bioenergy
- 7/8 2007: Launch of Bioenergy Webshore – Knowledge Management Tool, Virtual Working Space, Reference Source for Bioenergy related Information
- Bioenergy and Food Security Project: Analysis, capacity building and national/local level strategy and project development (started 1/2007)
- National task forces and case studies
- 4/2007: Expert meeting on sustainable bioenergy and food security at FAO headquarters in Rome; next meeting in 10/2007 presenting the analytical framework for bioenergy and food security
- State of Food and Agriculture 2008: bioenergy focus
- Global Bioenergy Partnership (GBEP) – policy level dialogue and related analysis

Thank you very much!

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  - International Bioenergy Platform (IBEP) http://www.fao.org/sd/en2_en.htm
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  - Global Bioenergy Partnership – GBEP-Secretariat@fao.org and coming soon: www.globalbioenergy.org
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