Bioenergy – modern option with multiple benefits

... and challenges

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Roundtable 3 – Opportunities for bioenergy development in Africa
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The energy reality of many African countries
Income and final energy consumption per capita in developing countries – typical trend

Source: WEO 2010.
Privileged climate and soil conditions for biomass production
Sizing the bioenergy potential along the chain

**Policies and Institutional Framework for Bioenergy Development**

**Local Potential**
- Natural conditions
- Know-how
- Priorities

**Biomass sources**
- Forest residues
- Agriculture residues
- Energy crops
- Waste

**Conversion technology**
- CHP (co-generation)
- Integration with other production systems
- Biofuels for transport
- Heat / cooling

**End-uses**
- Biofuels for transport
- Electricity
- Refrigeration
- Heat

**Logistics / infrastructure**
- Collection/processing
- Road/railroad systems
- Storage
- Industrial synergy

**Logistics / infrastructure**
- Distribution
- District cooling / heating
- Road / railroad systems
- Ports

**Demand Markets**
- Local
- Regional
- International

**Climate system**

**Natural capital**

**Carbon capture**
Total energy supply in Sweden 1970-2010, in TWh

616 TWh supply - 411 TWh useful energy

Source: Swedish Energy Agency and Statistics Sweden.
Note:  
1. Including wind power up to and including 1996.  
2. In accordance with the method used by UNECE to calculate the nuclear fuel energy input.
Renewable generation in electricity certificate system in Sweden 2003-2010, in TWh

Source: Swedish Energy Agency.
Renewables in the EU27, 1995-2008 (Mtoe)

Source: Eurostat
Present EU biomass potential (ktoe) per category

Source: AEBIOM 2011
The Brazilian energy matrix 1940-2010 (in $10^3$ toe)

Source: EPE, 2011
Primary energy supply in Brazil 2010 by primary source

Source: EPE, 2011
Brazilian sugar-ethanol production model

AGRICULTURE DEVELOPMENT

ELECTRIFICATION

INTERNATIONAL MARKETS /FOREIGN CURRENCY

sugarcane → washing → sugar extraction

bagasse → CHP plant

electricity

steam electricity

juice treatment

fermentation

distillation

distillation

sugar

ethanol

cane trash

CHP plant
Creating jobs through energy provision (the example of Brazil)

Source: Goldemberg, Jose (2002)
Production and exports of ethanol
1997-2010 Billions of litres

Sugarcane
Deforestation in the Brazilian Amazon 1991-2010, in km²

Source: IBGE, 2011
Brazilian domestic electricity supply 2010

Source: ONS 2010

Source: EPE 2011
Modern bioenergy – a tool for poverty reduction

- biomass widely available in many developing countries
- can deliver all the major forms of energy at any time
- offer synergy with other sectors (e.g. agriculture)
- can be carbon neutral and act as carbon sink
- can help restore unproductive degraded lands
- promote rural development (job and income generation, electrification)
- value-added more easily retained locally
- allow for reduction of fuel imports (improved trade balance)
Sizing the bioenergy opportunities: challenges ahead in Africa

- Evaluation of resource base and potential (i.e. land issues)
- Adaptation of technologies to local resources and conditions
- Policy framework to promote biomass-based projects
- Logistics to promote modern bioenergy – from agriculture to energy, environment and climate policy
- Multi-sectoral coordination: (i.e. public, private, donors) and industries (i.e. forestry, agriculture)
- Methodologies to evaluate multi-sectoral synergies and trade-offs
Questions to be addressed by the African Bioenergy Platform

• How can we develop sustainable bioenergy systems in Africa observing multi-sectoral synergies?
• What are the solutions that will lead to mitigation and adaptation to climate change while also promoting sustainable development?
• How can the development of bioenergy in Africa be supported by the global climate policy frameworks?