Food, Energy, Water, Climate Nexus: Potential in Cameroon

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UNEP Risø Centre
DTU Management Engineering

Nexus 2014 - Water, Food, Climate and Energy Conference
Outline of today's presentation

Background on the GNESD Network (facilitated by UNEP)

Food, Energy, Water, Climate Nexus: Potential in Cameroon

- Food production
- Bioelectricity production potential from agricultural residues (20% use)
- Water savings (potential) relative to the use of crude oil electricity
- GHG emissions reduction potential relative to the use of crude oil electricity
- Concluding comments
- Acknowledging our donors/sponsors
What is GNESD?

GNESD:

launched at the World Summit on Sustainable Development (2002)

is a global knowledge network involving 10 Centres of Excellence and Network Partners.
Objectives of GNESD:

Knowledge network

Policy analysis on environmentally benign energy systems and services that:

- can help achieve Millennium Development Goals
- are not harmful to human health;
- do not conflict with our food supply;
- result in poverty alleviation and
- achieving sustainable development in member countries
Centres of Excellence from developing countries

- Energy Research Centre, Univ. of Cape Town, (South Africa)
- AFREPREN (Kenya)
- ENDA-TM(Senegal)
- Mediterranean Renewable Energy Centre MEDREC (Tunisia)
- Asian Institute of Technology (Thailand)
- TERI (India)
- Energy Research Institute (China)
- Fundación Bariloche (Argentina)
- CENBIO/Univ. of São Paulo & CENTROCLIMA/Fed. Univ. of Rio de Janeiro (Brazil)
- Molina Centre on Energy and Environment, Mexico
How GNESD works ...

- Network Centres cooperate through activity based working groups
- Multi-regional (or country) efforts and cross learning
- Annual assemblies, teleconferences etc
- A steering committee provides strategic direction and oversight
- Management structure
- UNEP affiliated secretariat based in Denmark
Selected Summary for Policy Makers (SPM) Publications: download (free) at www.gnesd.org
Selected SPM Publications: download (free) at www.gnesd.org
Modern bioenergy from agricultural and forestry residues in Cameroon: Potential, challenges and the way forward

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HIGHLIGHTS
- Environmentally benign residues amount to $1.11 \times 10^6$ bone dry tonnes per annum.
- 0.12–0.32 billion litres of bio ethanol annually to displace 18–48% national gasoline use.
- 0.08–0.22 billion litres of biomass to BTL diesel per year to offset 17–45% of diesel use.
- 0.76–2.02 TW h of electricity, representing 15–38% of Cameroon’s consumption.
- Residues could offset only 3% of national consumption of traditional biomass.
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Cameroon:

- Total area of 475,440 km$^2$
- 3 times the size of North Carolina
- 1/21 times size of USA

Map source: www.cigarinspector.com
Cameroon: Electricity Access = 48.7% population  
(in)accessibility = 51.3% population

Source: IEA, 2009
Current Electricity Generation:

- Thermal electricity: 29.3%
- Hydroelectricity: 70.7%

Total: 1016 MW
<table>
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<th>Units</th>
<th>(tons)</th>
<th>n/a</th>
<th>n/a</th>
<th>(%)</th>
<th>(Mj/kg)</th>
<th>(wet tons)</th>
<th>(bone dry tons)</th>
<th>(bone dry tons)</th>
<th>GJ</th>
<th>MW h, (GJ x 0.28 x efficiency)</th>
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<td>Stalk</td>
<td>1.5</td>
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<td>15.48</td>
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<td>2.91E+05</td>
<td>1.22E+04 3.26E+04</td>
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<tr>
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<td>15.48</td>
<td>2.64E+05</td>
<td>2.24E+05</td>
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<td>6.66E+05</td>
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Food

Energy

a Agricultural crop production based on year 2010 statistics information (FAOSTAT, 2012).

b Residue to product ratio (RPR) was based on published information (OECD/IEA, 2010), except for industrial roundwood RPR.

c Lower heating values were based on published information (NREL, 2008), except for wheat, industrial roundwood and sawnwood.

d Lower heating values on wheat were based on published information (Maas et al., 2008).

e Decentralized bioelectricity generation method, based on Mendu et al., 2012.

Source: Ackom, et al., 2013 (with modifications)
Energy potential (bioelectricity) from residues:

- **Best case:**
  33% of national electricity consumption

- **Least case:**
  13% of national electricity consumption

- Residues could essentially power most farming communities at decentralized power system scales
GHG emission reduction potential (bioelectricity) from residues - (reference to crude oil powered electricity)

- **Best case:**
  
  1.7 Mt CO₂

- **Least case:**
  
  0.6 Mt CO₂
Water: Estimated 2 to 8 billion litres/year potential savings

Source: www.ewb-dc.org

Source: Ackom, 2014
Conclusion

- **Bioelectricity from agricultural residues exhibit good food-energy-water-climate nexus**

- **Extending electricity access should not always be about long transmission lines but decentralized systems could play key roles especially in rural farming areas**

- **The knowledge could possibly help inform decision makers regarding the good potential of residues for social and environmentally benign development**
Acknowledgement – donor gov'ts/organizations

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THANK YOU

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