Session 3: Resources Assessment, Options and Strategies

ECOWAS-GBEP 5th Bioenergy Week * 23 June 2017 * Accra, Ghana

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Bioenergy Analyst, IITC
IRENA under preparation:

Focusing on 5 countries:
- Ghana
- Mozambique
- Nigeria
- South Africa
- Uganda
## Preliminary Analysis of sub-Saharan Africa Biomass Potentials

Source: IRENA Analysis of FAO and Other Data

<table>
<thead>
<tr>
<th>Country</th>
<th>Residues Potential with 50% Collection (PJ/year)</th>
<th>Potential from Closing Yield Gap (PJ/year)</th>
<th>Potential from Reduced Waste If Yield Gap Is Closed (PJ/year)</th>
<th>Total Primary Energy Potential (PJ/year)</th>
<th>Converted 40% to Advanced Biofuel (PJ/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>399</td>
<td>1,269</td>
<td>246</td>
<td>1,914</td>
<td>766</td>
</tr>
<tr>
<td>Mozambique</td>
<td>429</td>
<td>1,026</td>
<td>260</td>
<td>1,715</td>
<td>686</td>
</tr>
<tr>
<td>Nigeria</td>
<td>2,090</td>
<td>5,668</td>
<td>1,285</td>
<td>9,043</td>
<td>3,617</td>
</tr>
<tr>
<td>South Africa</td>
<td>424</td>
<td>701</td>
<td>636</td>
<td>1,761</td>
<td>704</td>
</tr>
<tr>
<td>Uganda</td>
<td>534</td>
<td>735</td>
<td>752</td>
<td>2,021</td>
<td>808</td>
</tr>
<tr>
<td>Total</td>
<td>3,876</td>
<td>9,399</td>
<td>3,179</td>
<td>16,454</td>
<td>6,582</td>
</tr>
</tbody>
</table>

The analysis will be improved further.
Biofuel Potential

- Wood Logging and Processing Residues
- Agriculture Yield Growth
- Farm and Processing Residue
- Sustainable Land use
- Food Loss and Waste
## Annual Crop Production Growth - FAO Projection

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>2.2</td>
<td>2.3</td>
<td>2.3</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>Developing</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
<td>1.4</td>
<td>0.8</td>
</tr>
<tr>
<td>- excl. China &amp; India</td>
<td>2.8</td>
<td>2.8</td>
<td>3.2</td>
<td>1.7</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Sub-Saharan Africa</strong></td>
<td><strong>2.6</strong></td>
<td><strong>3.3</strong></td>
<td><strong>3.0</strong></td>
<td><strong>2.4</strong></td>
<td><strong>1.9</strong></td>
</tr>
<tr>
<td>(43% increase)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>2.7</td>
<td>2.9</td>
<td>3.7</td>
<td>1.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Near East and North Africa</td>
<td>2.9</td>
<td>2.5</td>
<td>2.4</td>
<td>1.4</td>
<td>0.9</td>
</tr>
<tr>
<td>South Asia</td>
<td>2.6</td>
<td>2.4</td>
<td>2.1</td>
<td>1.5</td>
<td>0.9</td>
</tr>
<tr>
<td>East Asia</td>
<td>3.4</td>
<td>3.6</td>
<td>3.2</td>
<td>1.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Developed</td>
<td>0.8</td>
<td>0.4</td>
<td>0.5</td>
<td>0.8</td>
<td>0.3</td>
</tr>
<tr>
<td>44 countries over 2700kcal/person/day</td>
<td>2.6</td>
<td>2.9</td>
<td>2.1</td>
<td>1.1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Source: Alexandratos & Bruinsma (2012) Table 4.3
Climate Change, Natural Disasters, Water and Food Security and Competition over Good Land since yr. 2000

-Farmers know where is a good land and already occupied
-Population growth and climate change increase land resources demand

Dry up corn
Increasing unpredictability
November 2012

Photo: Flood in Limpopo
World Bank, Jan 2013

WFP Food Distribution at Camp
Photo: World Bank, Jan 2013
Ghana, Mozambique and Uganda Cereal Production Trend 2000-2014

Cereal Production [Mton]

Fluctuation by frequent drought and flood

Uganda looks constant upwarding trend; but food insecurity at various part of the country (WFP)

FAOSTAT (accessed 2017)
Nigeria and South Africa Cereal Production Trend 1990-2014

Cereal Production [Mton]

Not always upward trend but certain degree of uncertainty must be considered

FAOSTAT (accessed 2017)
Biofuel Potential

- Sustainable Land use
- Wood Logging and Processing Residues
- Agriculture Yield Growth
- Farm and Processing Residue
- Food Loss and Waste
## Estimated Food Waste Percentage – Sub-Saharan Africa

(A developed country region)

Source: FAO (2011) Annex 4

<table>
<thead>
<tr>
<th></th>
<th>Agricultural Production</th>
<th>Postharvest handling and storage</th>
<th>Processing and Packaging</th>
<th>Distribution</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cereals</strong></td>
<td>6% (2%)</td>
<td>8% (2%)</td>
<td>3.5% (0.5%,10%)</td>
<td>2% (2%)</td>
<td>1% (27%)</td>
</tr>
<tr>
<td><strong>Roots and Tubers</strong></td>
<td>14% (20%)</td>
<td>18% (10%)</td>
<td>15% (15%)</td>
<td>5% (7%)</td>
<td>2% (30%)</td>
</tr>
<tr>
<td><strong>Oilseeds and pulses</strong></td>
<td>12% (12%)</td>
<td>8% (0%)</td>
<td>8% (5%)</td>
<td>2% (1%)</td>
<td>1% (4%)</td>
</tr>
<tr>
<td><strong>Fruits and Vegetables</strong></td>
<td>10% (20%)</td>
<td>9% (4%)</td>
<td>25% (2%)</td>
<td>17% (12%)</td>
<td>5% (28%)</td>
</tr>
<tr>
<td><strong>Meat</strong></td>
<td>15% (3.5%)</td>
<td>0.7% (1%)</td>
<td>5% (5%)</td>
<td>7% (4%)</td>
<td>2% (11%)</td>
</tr>
<tr>
<td><strong>Fish and seafood</strong></td>
<td>5.7% (12%)</td>
<td>6% (0.5%)</td>
<td>9% (6%)</td>
<td>15% (9%)</td>
<td>2% (33%)</td>
</tr>
<tr>
<td><strong>Milk</strong></td>
<td>6% (3.5%)</td>
<td>11% (0.5%)</td>
<td>0.1% (1.2%)</td>
<td>10% (0.5%)</td>
<td>0.1% (15%)</td>
</tr>
</tbody>
</table>
Bioenergy plant location potential from supply data

GIS based analysis (Ghana)
(a) 100kWh /yr - Small Scale Power Plant
(b) 2500 ton or 1000 ton Pellet factory
Collect biomass from 12 km radius

<table>
<thead>
<tr>
<th>Commodity</th>
<th>No. plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoa husk</td>
<td>233</td>
</tr>
<tr>
<td>Oil palm EFB</td>
<td>123</td>
</tr>
<tr>
<td>Maize</td>
<td>298</td>
</tr>
<tr>
<td>Groundnut</td>
<td>148</td>
</tr>
</tbody>
</table>
Food loss and waste – a solution tried in Zambia

2017 - Virtual Farmers’ Market: A digital solution connecting farmers to markets

- Enable farmers to search the most profitable market to sell their products
- Use mobile phone app
- Buyer pay the membership while farmers not
- Not only WFP, many African countries are making efforts

Huge investment is necessary to reduce the loss and waste
- vaccination for animals, road network, storage and delivery system
Share of Wood Energy in Sub-Saharan Africa (as of 2009)

IRENA (2014) based on IEA (2009)

80% of energy was soil biomass – fuel wood & charcoal in 2009

Forest degradation, respiratory disease, deforestation, time consuming labour

Many countries in Africa are seeking alternative solutions
Apply 3 different rate types for 26 species available for wood energy (for Asia study)

P: Pulp (80% of harvested wood assumed use for pulp or paper; 20% available for energy use)
L + F: Lumber and Furniture/Other (60% used as timber or furniture, 40% energy)
A + F: Animal fodder and Furniture/Other (85% for non-energy uses, 15% for energy)
Example from Asia

Sustainable Wood Energy and Crop Lifecycle: Rubber case

Resin harvest period: 30 years = 30 Year Rotation Cycle – Sus. Land Use

IRENA (2017)
Conclusion: What is need to consider to improve biomass supply potential analysis?

- Climate change variabilities increase – take into account both challenge and opportunity
- Improvement of statistical information can increase better projection
- Bioenergy is not the only solution, combination with other renewable solution can increase resilience
- Please use IRENA tools
  - Bankable proposal
  - Potential simulation
  - Fund for Investment
  - Business matching
Sustainability is a key – Recent policy statement

- IRENA-FAO- IEA
  “Bioenergy for Sustainable Development”
  January 2017
  

- IRENA statement for UNFCCC
  “Role of Renewable Energy for REDD+”
  May 2017
  
Call for Good Practice: International Workshop

Please share your good practices!

Reference

- Alexandratos, N. and J. Bruinsma (2012), World agriculture towards 2030/2050: the 2012 revision, Food and Agricultural Organization, Rome
- FAO (n.d.) FAOSTAT
- Gustavsson, J. et al. (2011), Global food losses and food waste – Extent, causes and prevention, Food and Agricultural Organization, Rome
- IMF (n.d) Database
- IRENA (2014) Biomass Potential in Africa
- IRENA (2017) Biofuel Potential in Southeast Asia: Raising food yields, reducing food waste and utilising residues
- NBF (n.d.) Sustainable action with biomass energy (http://www.nbf-web.com/index.html)
- World Food Programme (2017) Virtual Farmers’ Market
Thank you

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