The Sweet Sorghum-to-Ethanol Initiative: The Nigerian Experience.

A Presentation To

SWAC FORUM 2011

By

Felix Babatunde Obada, PhD.
GMD/CEO Global Biofuels Nigeria

6th Dec. 2011
Praia, Cape Verde.

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Sweet sorghum does not compete with food chain
Why Sweet Sorghum?

• Growing period (about 4 months) as against 9-16 month for sugarcane.
• Water requirement (8000m³) as against 25,000m³ sugarcane
• As against cassava and corn, does not compete with food chain
• Cost of cultivation of sweet sorghum is 3 times lower than sugarcane
• Soft and friendly, requires less energy to crush
• Sequesters carbon dioxide better than other energy crops
• Leaves excellent as animal feed
• Effluent usable as liquid fertilizer
• The entire plant is useful
• Ethanol burning quality is superior- less sulphur than from sugarcane.
### COMPARATIVE Advantages of Using Sweet Sorghum as Raw Material for Ethanol Production: Relative to other sources

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sweet Sorghum</th>
<th>Sugarcane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting Cycle</td>
<td>4 months</td>
<td>9 – 16 months</td>
</tr>
<tr>
<td>Cycle(s) per year</td>
<td>2-3</td>
<td>1</td>
</tr>
<tr>
<td>Water Requirement</td>
<td>60 – 70%</td>
<td>100%</td>
</tr>
<tr>
<td>Fertilizer Requirement</td>
<td>40%</td>
<td>100%</td>
</tr>
<tr>
<td>Stalk Production (MT/Ha/Cycle)</td>
<td>45 – 75/cycle</td>
<td>65 – 80</td>
</tr>
<tr>
<td>Fermentable Sugar (Concentration in stalk % w/w)</td>
<td>3.6 – 6.2/cycles</td>
<td>10.0 - 14.0</td>
</tr>
<tr>
<td>Fermentable Sugars (Yield MT/Ha/Cycle)</td>
<td>9.0 – 12.0</td>
<td>6.0 – 10.5</td>
</tr>
<tr>
<td>Ethanol Yield (Litres/Ha/Cycle)</td>
<td>2020 – 3500/cycle</td>
<td>3400 – 6000</td>
</tr>
<tr>
<td>Bagasse Yield (MT/Ha/Cycle @ 50% moisture)</td>
<td>10 – 14/cycle</td>
<td>19 – 24</td>
</tr>
<tr>
<td></td>
<td>20 – 28/2 cycle</td>
<td>(30% on cane weight)</td>
</tr>
</tbody>
</table>

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CONVERSION TECHNOLOGY

* **Sugar Based (Sweet Sorghum, Sugar Cane etc):**
  Sugar + Micro Organisms (Yeast) = Ethanol

* **Starch Based (Cassava, Corn, etc.):**
  Starch + Enzymes + Micro Organisms (Yeast) = Ethanol

* **Cellulose (sugar from any plant)**
  pre-treating chemically into sugars + ferm.= Ethanol

Each conversion method leads to different Production Technology, Bio-refinery Design and costs. Sweet Sorghum Refinery Design Simplest and Cheapest

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Challenges

• Finance.
• Policy and Regulatory Framework.
• Legislation.

Opportunities

• Grants to developers.
• Soft Loans/Intervention Funds.
• National Body to oversee the orderly development of the biofuels sector.

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About Global Biofuels Nigeria

- Established in 2008
- Pioneering the development of the Biofuels Industry in Nigeria
- In Collaboration with:
  - Various State Governments
  - The Nigerian National Petroleum Corporation
  - Nigerian Export-Import Bank
  - The Ecowas Bank for Investment & Development
  - China Export Credit Insurance Corporation
  - International Crop Research Institute for the Semi-arid Tropics
  - The Institute of Agricultural Research Nigeria
  - National Animal Production Research Institute Nigeria
- KPMG- Project Managers.

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THANK YOU