BIOFUELS: LEVERAGING THE VAST AGRICULTURE POTENTIAL IN NIGERIA TO CREATE WEALTH, EMPLOYMENT AND SUSTAINABLE DEVELOPMENT

BY
GGM, RED
HISTORICAL SECTORAL CONTRIBUTIONS TO GDP GROWTH:

- From pre-independence to mid 70s, Agriculture provided the seed capital for the development of the oil and gas industry in Nigeria.
- By 2006, oil and gas contributed about 37% of GDP, while agriculture contribution to GDP declined from 54.99% in 1966 to 32%.
- Today, there is a strong case for the oil and gas sector to contribute in the re-launch of the agricultural sector.
- The major end-product of the agric re-launch is **Biofuels**

Source: National Bureau of Statistics
The rise in global demand for energy fuelled mainly by China & India and the persistent rise in prices of crude oil has led to increased interest in alternative sources of energy, renewable energy sources in particular.
THE NEED FOR BIOFUELS

Co₂ Carbon Emission bring adverse Effect on Environment
Alternatives to Address Inventory of Energy/Fuel Supply Need to be Explored

- Ready Answers

1. Renewable Energy
2. Nuclear Energy
3. Clean Coal Technology
Renewable Energy Sources

1. Biomass Energy
2. Solar Energy
3. Wind Energy
4. Geothermal Energy
5. Hydropower
6. Tide / Wave Energy
THE NIGERIAN ENERGY RESOURCES

- Energy Resources in Nigeria include: **Crude Oil, Natural Gas, Coal, Tar Sand & Renewables** *(Biomass, Hydro, Solar, Wind, etc.)*
- Estimated Oil Reserve in Nigeria is 35.9 billion bbls
- Natural Gas is estimated at **185 trillion cu. ft** of proven reserve as at Jan. 2006 *(OGJ).*
- Coal and Lignite Reserves are estimated at **2.75 billion tons.**

- The 35.9 billion barrels of oil in reserve will be depleted by 36 – 40 years with **daily** production of **2.2 MM bbls.**
- With this scenario, Nigeria needs to think of developing alternative sources of Energy.
- Renewable Energy will increase supply and reduce the demand on Oil reserve.

Source: *Oil and Gas Journal, 2007*

### Nigeria’s Renewable Energy Potentials

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Potentials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydropower</td>
<td>14,750MW <em>(high potential)</em></td>
</tr>
<tr>
<td>Biomass</td>
<td>High potential</td>
</tr>
<tr>
<td>Solar Radiation</td>
<td>3.5 – 7.0 kWh/m²/ day</td>
</tr>
<tr>
<td>Wind</td>
<td>2 – 4 m/s (annual average)</td>
</tr>
<tr>
<td>Geothermal</td>
<td>2 Nos known in Nigeria <em>(Ikogosi warm spring in Ekiti &amp; Wiki springs in Bauchi)</em></td>
</tr>
<tr>
<td>Ocean, Tidal &amp; wave energy</td>
<td>Low prospects in Nigeria</td>
</tr>
</tbody>
</table>

### Nigeria’s Biofuels Demand Potentials

<table>
<thead>
<tr>
<th>Biofuels type</th>
<th>Time frame</th>
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<tbody>
<tr>
<td><strong>Bio-ethanol</strong></td>
<td></td>
</tr>
<tr>
<td>(demand in billion</td>
<td>Short: 1.3 (at 10% blend</td>
</tr>
<tr>
<td>liters/yr)</td>
<td>with PMS)</td>
</tr>
<tr>
<td></td>
<td>Medium: 2.72 (at 15% blend</td>
</tr>
<tr>
<td></td>
<td>with PMS)</td>
</tr>
<tr>
<td></td>
<td>Long: 9.22 (at 50% blend</td>
</tr>
<tr>
<td></td>
<td>with PMS)</td>
</tr>
<tr>
<td>Bio-diesel</td>
<td></td>
</tr>
<tr>
<td>(demand in billion</td>
<td>Short: 0.233 (at 10% blend</td>
</tr>
<tr>
<td>liters/yr)</td>
<td>with AGO)</td>
</tr>
<tr>
<td></td>
<td>Medium: 1.2 (at 20% blend</td>
</tr>
<tr>
<td></td>
<td>with AGO)</td>
</tr>
<tr>
<td></td>
<td>Long: 3.5 (at 50% blend</td>
</tr>
<tr>
<td></td>
<td>with AGO)</td>
</tr>
</tbody>
</table>

*Adapted: National Energy Master Plan*
Nigeria’s Agricultural Potentials For Biofuels

**Agricultural Resources**

1. Arable Land – 33 Million Hectares
2. Climate and Ecology – Very Favourable (Similar to Brazil)
3. Skilled and Unskilled Labour – Abundantly Available
4. Financial Capital - Available

Based on this potentials, studies have been launched that proved the prospects of Biofuels Project
Prospective Biofuels Project Sites

- **Current Sugarcane Projects**
  - **Cassava: 13,500 ha**
  - **2 projects /2 investors**
  - **EtOH: 38 million liters /yr**
  - **Starch: 36,000 tonnes /year**
  - **Investment: $115 million**

- **Current Cassava Projects**
  - **Sugarcane 16,000 ha**
  - **3 projects/5 investors**
  - **EtOH: 75 million liters/yr**
  - **Sugar: 116,000 tonnes/year**
  - **Electricity: 64 MW**
  - **Investment: $322 million**

- **Current Oil Palm Projects**
  - **Palm Oil: 60,000 /32,000 t/yr**
  - **Biodiesel: 38/21 million liters/year**
  - **Investment: $75 / 44.5 million**

- **Private-led Biofuels Projects**
  - **Cassava to F/Ethanol – Ekiti/St**
  - **S/Sorghum to F/Ethanol – Ondo/St**
  - **Investment: $115 million**

There is potential for many more projects in other states.
ECONOMICS OF THE PROJECTS

SUMMARY OF BUSINESS STUDIES ON BIOFUELS INDUSTRY PROJECTS
The Business prospects of the projects are attractive

SUGAR CANE – ETHANOL

Size: 20,000ha
Ethanol: 75m lit.pa
Sugar: 116,000 tpa
Total Investments: $322m
IRR: 31.97%
Payback Period: 7 years
NPV: $350m
Fin. (Debt: Equity): 55%:45%

CASSAVA – ETHANOL

Size: 15,000ha
Ethanol: 38m lit.pa
Starch: 36,000 tpa
Total Investments: $110m
IRR: 28.36%
Payback Period: 6 years
NPV: $78m
Financing (Debt: Equity): 55%:45%

OIL PALM - BIODIESEL

Size: 16,000ha
Biodiesel: 34m lit.pa
Palm Oil: 30,000 tpa
Total Investments: $75.19m
IRR: 22.79%
Payback Period: 12 years
NPV: $91.24m
Financing (Debt : Equity): 55%:45%
BENEFITS OF BIOFUELS PRODUCTION

Wealth Creation
- Agriculture employs about 70% of the population
- Only 10% of Nigeria’s 33 million ha arable land is utilised.
- Estimated FDI is over $1.1 billion for 20 projects

Employment Generation
- Enormous potentials for job creation
- 850,000 jobs created in Brazil biofuels programme

Food Security & Power Generation
- Biofuels plants will increase food availability
- Sugar, Starch, Vegetable oil, Animal feed will be produced
- Power generation through cogeneration

Excellent returns on capital
- Biofuels projects have high IRRs (~30%) plus shorter pay-back periods compared to typical oil & gas projects.

Energy security
- E10 blend and Biodiesel will enhance energy mix
- Lower cost fuel

Cleaner fuel
- Biofuels are cleaner than fossil fuels
- Biofuels projects qualify for carbon credit
Projected Benefits of the NNPC-Led Biofuels Programme

(1) Wealth

<table>
<thead>
<tr>
<th>Projects benefits</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of fuel ethanol Produced (Million Liters)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>475</td>
<td>675</td>
</tr>
<tr>
<td>Volume of Biodiesel Produced (Million Liters)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Environmental Benefits (CO₂ Emission Reduction)</td>
<td>0</td>
<td>0</td>
<td>0.73</td>
<td>1.45</td>
<td>2.17</td>
</tr>
<tr>
<td>Employment (No. of Direct Jobs)**</td>
<td>1,000</td>
<td>5,250</td>
<td>12,000</td>
<td>21,000</td>
<td>32,250</td>
</tr>
<tr>
<td>Power Generated for National Grid (MW)</td>
<td>0</td>
<td>0</td>
<td>210</td>
<td>175</td>
<td>245</td>
</tr>
<tr>
<td>Wealth Creation [Foreign Direct Investment ($Million)]</td>
<td>87</td>
<td>22</td>
<td>362</td>
<td>412</td>
<td>412</td>
</tr>
</tbody>
</table>

Assumptions based on NNPC-led Projects
- 2011-2012: 3 Sugar Cane + 2 Cassava + 2 Biodiesel Projects
- Assuming 50% fuel ethanol / Biodiesel from each project
- Power supplies to National grid from Co-generation.
  **Jobs created indirectly should range between 4 to 8 times direct jobs
- 2009 - 2010: 2 Sugar Cane + 1 Cassava + 1 Biodiesel Projects
### Projected Benefits of the NNPC-Led Biofuels Programme

**2 Food**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sugar</strong></td>
<td>Volume (mmt/yr)</td>
<td>-</td>
<td>0.4</td>
<td>0.8</td>
<td>1.2</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Value ($mm)</td>
<td>-</td>
<td>240</td>
<td>480</td>
<td>720</td>
<td>960</td>
<td>1,200</td>
</tr>
<tr>
<td><strong>Palm Oil</strong></td>
<td>Volume (mmt/yr)</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Value ($mm)</td>
<td>-</td>
<td>-</td>
<td>52</td>
<td>110</td>
<td>117</td>
<td>186</td>
</tr>
<tr>
<td><strong>Starch</strong></td>
<td>Volume ('000 tons/yr)</td>
<td>-</td>
<td>58</td>
<td>116</td>
<td>174</td>
<td>232</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>Value ($mm)</td>
<td>-</td>
<td>20</td>
<td>41</td>
<td>61</td>
<td>81</td>
<td>102</td>
</tr>
</tbody>
</table>

*Source: Technical Feasibility Studies Report*

*Note: CO2, Animal feed and glycerin are other by-products to be used by food, cosmetics and livestock markets*
Projected Benefits of the NNPC-Led Biofuels Programme

(3) Addition to GDP

GDP Impact of the Biofuels Industry

Note: GDP Impact = Private consumptions + Government expenditure + Investment + Net exports

For the purpose of this presentation we computed impact by: Product Sales + Investments
NNPC is strategically positioned to drive the Biofuels programme in Nigeria

- NNPC is the only group with downstream assets and experience that constitute composite resource potential for the handling, blending and distribution of fuel ethanol and biodiesel across the country.
- Investors will be more inclined to invest in Biofuels projects if NNPC is involved (as an investor and as product off-taker) in line with policy on Biofuels.
- NNPC is to be an investor in the Biofuels industry not a regulator.
- Petrobras, a similar NOC like NNPC has a functional Biofuels unit and is currently expanding its ethanol export capacity.

Proposed role for NNPC in its Biofuels project is to be a co-investor, not a plantation / plant operator.

- Lead Investor: Majority Ownership, Project Development Leadership (financing, operational design, etc.), Operate plantation and plants
- NNPC: Minority Ownership, Supports Project Development Process & Activities, Does not operate
NNPC has invested significant resources in the promotion of the Biofuels programme with positive results:

**POLICY**
- Biofuels Policy approved by the Federal Executive Council and gazetted (Gazette No. 72, June 20th 2007)

**IMPORTS**
- Agreement with Petrobras for supply of ethanol and technical assistance (to be renewed)

**INFRASTRUCTURE**
- Atlas Cove and Mosimi depots initially commissioned for programme take-off (to be recertified)
- Alternative storage & blending facilities (NIPCO) identified

**ETHANOL**
- Developed 5 bankable feasibility studies for sugarcane & cassava ethanol
- 2 investors waiting for NNPC to commit to invest
- 5 others eager to conduct due diligence

**BIODIESEL**
- Completed 2 feasibility studies for oil palm to biodiesel projects
ROADMAP FOR 500,000 HA INTEGRATED BIOFUELS ENERGY INDUSTRY BY 2020

Short term goals

2009: Recommit
- Approve budget for initial NNPC JV projects
- Implement policy (off-takes, etc.)
- Launch E10
- Develop shared ownership with relevant MDAs
- Kick-off bill

2010: Foundation
- Create first JVs
- Follow-up of bill passage
- Upgrade distribution infrastructure
- Sanction 2 or more private projects
- Expand financing facilities

2011: Begin Feedstock Production
- >33,000 ha developed
- >100,000 tons cassava harvested
- >3,500 jobs created
- Launch B5 seeding programme

Medium term goals

2012: Begin production of Ethanol
- >65,000 ha developed (incl. cassava, sugarcane and palm oil)
- 10+ million litres ethanol/year
- Begin production of sugarcane

2016: Ramp-up Industry
- 250,000 ha developed (70,000 ha in Biofuels production*)
- 360 million litres ethanol/year
- 120+ MW cogeneration
- Begin production of palm biodiesel (15 million litres/year)

Long term goals

2020: Sustain Growth
- Seek increasing use of biofuels beyond E10 and B5
- 500,000 ha developed (285,000+ ha in Biofuels production*)
- 1.2 billion liters of Biofuels/year
- 600+ MW cogeneration
- $6+ billion invested

Note: *There is a lag of 3 to 6 years between land development and biofuel production depending on the crops
CONCLUSION

- Opportunities for Investors to Co-Champion Biofuels Production in Nigeria as Major Stakeholders present very prospective leads
THANK YOU