Agro-industrial residues (pellets and briquettes for combustion, gasification and biochar systems)

ECOWAS/Global Bioenergy Partnership 5th Bioenergy Week and Study Tour for Capacity Building: Ghana, Accra 22nd – 24th June 2017

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Outline

- Biochar systems
- Biochar system for small biochar plant - Pellet as fuel
- Large plant Pyro-Gasifiers
- Benefits of biochar/biofertilizer
- Other use of excess biochar, briquette and alternative fuel
- Energy access opportunities
- Environmental benefits
- Socio economic impacts
A System comprises of independent and interrelated parts
Simple biochar system for Small Biochar Plant for cooking and heating water

- Agro waste
- Pellet
- Soil amendment
- Char

Stove
70% = Gas
30% = Char

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Large plant Pyro-Gasifiers

100% Biomass as input

For Factory & rural electrification
Large Plant for factory/off grid power
90% of Biomass converted to
10% = Biochar

Bioelectricity Production/Off grid energy access

Biomass source or a central point where biomass can be easily accessed.

Biofertilizer for application to farm land

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Biomass electricity and biochar production technologies

- Thermochemical
  - Combustion: \( CO_2 + \text{Ash} \)
  - Gasification: \( \text{Gas} + \text{Ash} \)
  - Pyrolysis: \( \text{Biochar} + \text{Gas} \)
Benefits of Biochar/Biofertilizer

- **Biochar** helps produce healthy food by preventing the crop from absorbing toxic elements like weedicide and other heavy metals from mining activities;

- **Biochar** helps water and nutrients retention of the crop land over long period and make it available to the plants;

- Application of biofertilizer changes the soil structure by improving soil fertility;

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Other uses of biochar, Briquette and alternative fuel

Biochar not used for soil amendment = can be processed into briquette

- Briquette charcoal is used as fuel in clean cook stoves without depending on wood harvest to make charcoal.
- Implication ↔ 100% non dependence of forest harvest for charcoal for cooking.

Agro waste processed in larger solidified uniform parts as fuel

- Briquette used as fuel in modified Elsa biochar stove

- Biochar small produces alternative fuel in uniform parts- Empty palm bunches/Kernel shells, baobab pods; wood chips; etc.
Energy Access Opportunities

Comparatively lower cost of energy for cooking and heating water 1.5 kg of fuel for 1-2 hours depending on fuel quality and weather for family of 3-12 people.

Technology is flexible to develop to meet several household and industrial cooking needs including micro restaurants; oil processing; gari frying; fish smoking and other higher level industrial cooking.

Product idea generation/Technical feasibility analysis; Boiling and Fuel performance Testing

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Our observations so far within the communities

- Increase energy access to households;
- **Lower energy cost as compared to Charcoal, Wood fuel and LPG Gas**;
- It cooks faster than other alternative cook stoves thus saves time for other household and economic activities.
Energy Access Opportunities

Energy adoption could further be improved through perfect finishing and reaching economies of scale to lower cost for all categories of users within the pyramid.

- Stove Pyramid of over 4600 Users

- Rich Users (1%)
- Middle class users (29%)
- Poor Household Users (70%)
Environmental

Positive Impact

- Improved soil fertility - the char after cooking, Biochar, is used to make NPK biofertilizer to improve soil fertility, soil structure and farm yields.
- Helps in community waste management as waste is turned into fertilizer - communities become more climate conscious.
- Reduces both indoor and outdoor pollution.
- Deduces dependence on forest for fuel;
- Climate mitigation - 100% carbon sink - 70% carbon in crop residue to produce gas for cooking and 30% carbon into the soil through organic NPK fertilizer application.

Sample biochar farm and outputs
Biochar technology adoption to reduce the use of chemical fertilizer and improve agriculture with Gender focus to address climate change related poverty.

Training, motivating and providing support for women/men in making biofertilizer to improve their crop yields and actively involving them in addressing agricultural marketing bottlenecks through innovativeness.

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Quality food - Improved healthy organic food for healthy population;

Biofertilizer is capable of changing soil structure to fertile for all types of soil;

Direct and indirect job creation of the value chains within the biochar system:
- Fuel collection,
- Fuel peletising and sale
- Stove production and sale;
- Biochar production and sale;
- Biochar fertilizer making and sale;

Reduction in import bill for chemical fertilizer with NPK biofertilizer substitution.
Conclusion

- **Biochar** systems provide energy access for green economy that will improve food security, well being and environment;
- **Biochar** Energy Systems provide opportunities for Business spin off and Socio Economic development.
Thanks for your attention!

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