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

Mrs. Veronica Agoodoa Kitti, ASA initiative, Ghana
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% Biomas 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

Biofertilizer for application to farm land

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

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Biomass electricity and biochar production technologies

Thermochemical

- Combustion: \( \text{CO}_2 + \text{Ash} \)
- Gasification: \( \text{Gas} + \text{Ash} \)
- Pyrolysis: \( \text{Biochar} + \text{Gas} \)

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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

<table>
<thead>
<tr>
<th>Biochar not used for soil amendment</th>
<th>Agro waste processed in larger solidified uniform parts as fuel</th>
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<tbody>
<tr>
<td>can be processed into briquette</td>
<td>• Briquette used as fuel in modified Elsa biochar stove</td>
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<tr>
<td>• Briquette charcoal is used as fuel in clean cook stoves without depending on wood harvest to make charcoal.</td>
<td>• Biochar small plant uses other alternative fuel in uniform parts- Empty palm bunches/Kernel shells, baobab pods; wood chips; etc.</td>
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<tr>
<td>• implication ↔ 100% non dependence of forest harvest for charcoal for cooking.</td>
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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.

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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%)

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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

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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.
Socio Economic Impacts

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.

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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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