

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

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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

Biochar System

A System comprises of independent and interrelated parts

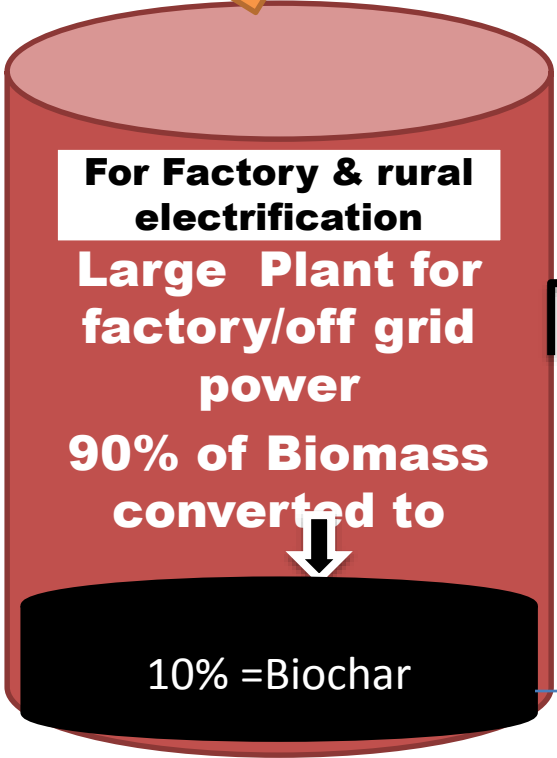


Simple biochar system for Small Biochar Plant for cooking and heating water



Large plant Pyro-Gasifiers

100% Biomass as input



Bioelectricity Production/Off grid energy access

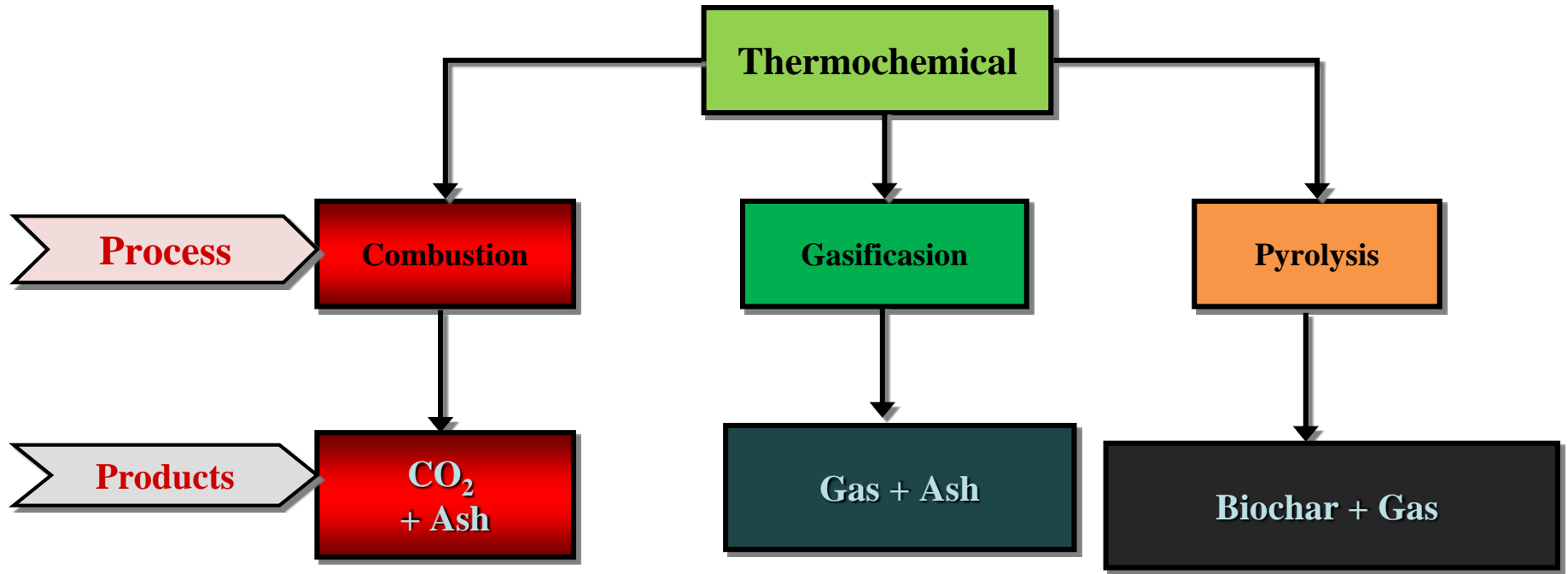
Biomass source or a central point where biomass can be easily accessed.



Biofertilizer for application to farm land



Biomass electricity and biochar production technologies



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;



Biochar Maize Farm, Ghana

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.**

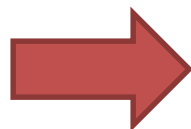
Agro waste processed in larger solidified uniform parts as fuel

- Briquette used as fuel in modified Elsa biochar stove



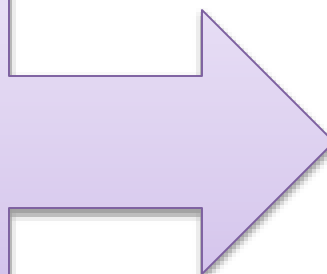
- Biochar small p alternative fuel in uniform parts- Empty palm bunches/Kernel shells, baobab pods; wood chips; etc.

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

Our observations so far within the communities

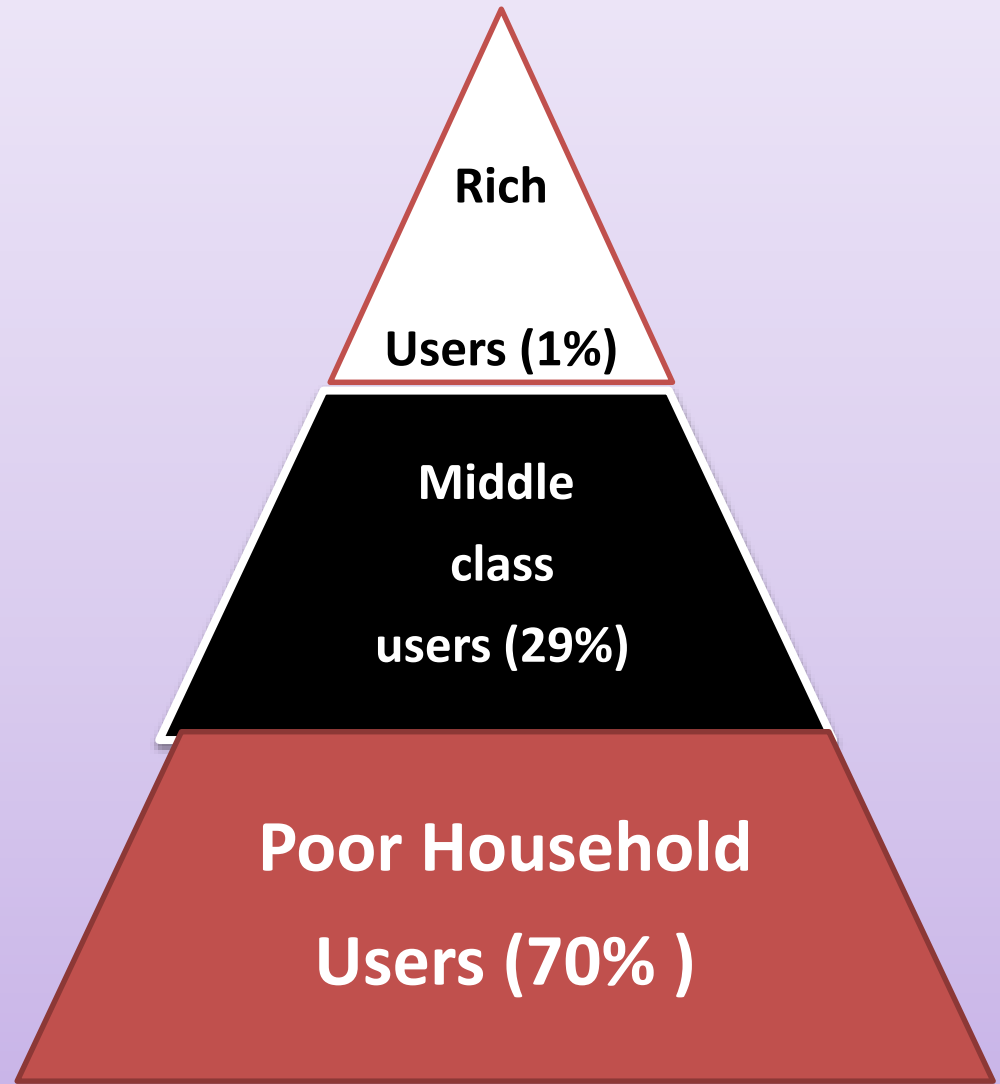
- Increase energy access to households;
- **Lower energy cost as compared to Charcoal, Wood fuel and LPG Gas;**
- It cooks faster than other alternative cook stoves thus saves time for other household and economic activities.



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



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



Socio Economic Impacts- Turning farming into viable business



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.



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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