

Biochar and Food, Water and Energy NEXUS

International Workshop: Sustainable Rural Bioenergy Solutions in Africa, World Agroforestry Center (ICRAF) International Conference Room, 19th January, 2018

Veronica Agodoa Kitti, ASA Initiative (Ghana) and Africa Biochar Partnership (ABP) Steering Committee Member

OUTLINE

- Problem Highlight
- The History
- Biochar technology
- Biochar technology performance and uses-
Energy ..
- Biochar and Food; Biochar/biofertilizer
nutrient and water NEXUS
- International recognition

Problem?

Situation

- Land degradation and poor soil fertility due to deforestation and climate change;
- Drought /Irregular rainfall/Poor or no harvest;

Challenge

- Food insecurity;
- Inefficient Energy Access;

Effect

- Climate change related poverty;
- Migration.

THE HISTORY

- The ELSA (biochar) burner was developed for Africa through scientific cooperation between ASA Initiative, ECREEE, Starter and European/African Universities under EU/ACP S&T Programme ●

BeBi Project

EU/ACP S&T
Programme I



BIOCHAR PLUS

EU/ACP S&T
Programme II

BIOCHAR TECHNOLOGY

- Slow pyrolysis, low-temperature plant/cooking stove
- **Uses biomass -agro and agro-industrial residues/waste for pellet as fuel; and**
- **raw biomass such as empty palm bunches, various types of nuts shells and corn cobs etc.**

- Pyrolysis process, syngas released from feedstock, is burnt cleanly with negligible emissions of CO_2 , CO , NO_x and PM, = improving indoor/outdoor air quality over wood & charcoal stoves.



Pelletizing or fuel processing



Turning Waste into Fuel

Corn cob -Agrowaste



**Pellets for cooking = more efficient
burning time**



Biochar burner-One aspect of the Technology

Efficient quality biochar

- Produces heat for cooking and releases by-product-
Biochar



Biochar from Biomass



Performance of Technology

Energy - Performance

- 0.6-1.5kg of fuel produced energy for cooking for 1-2hrs depending on fuel quality and air conditions with fire power of 2.7kw;
- Used to cook for 2-12 household members.
- Up to an hour for industrial cooking with solid biomass;
- High thermal efficiency 20 - 25%

Biochar-Output and quality

- **100%** of biomass input results into **25-30%** biochar;
- High level biochar ;



ELSA BIOCHAR TECHNOLOGY-USES

- ❖ The energy produced is **Green**; carbon stored in the biomass (70%-90%) converted to gas (10% to 30%) turned to black char (**biochar**)
- ❖ It could be used for cooking & produce biochar simultaneously **or** to produce only biochar **or**
- ❖ converted to generate bio-electricity .



1. Domestic use=Household cooking

2. Industrial use =Oil processing etc



Effect of Energy access:

- by 17,576 resident families would cause a decrease in deforestation rates of 0.12% year⁻¹ (=25,530 t of wood year⁻¹) with fuel substitution of waste coffee husk, corn cob etc

Capable of producing fire power of 187,068 MJ year⁻¹

- Carbon stored in fuel (biomas) =1/2 is converted to gas and 1/2 remains in the created char. *(Source: adapted from Wilson (2013), based on Biochar Solutions Inc. (2011), printed in Roth (2014)*

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.

- **Large Plant for factory/off grid power**
- **90% of Biomass converted to**

**Biofertilizer for
application to farm land**



Biofertilizer for Soil Amendment

- Biochar/Biofertilizer



- Biochar fields



Output of Maize farm with Biochar Treatment

- ❖ **Resistant to drought;**
- ❖ **Resistant to army worm infections.**

- Healthy and sturdy growth;
- Maize on every part of the cob.
- More biomass generated.



Double Output

Maize from Non Biochar treated farm

**Maize Farm with no biochar =Same
maize variety =less biomass**

**Maize Output with no biochar
treatment**



...continue- Biochar/Biofertilizer

- **Biochar** helped produce healthy food by preventing the crop from absorbing toxic elements like weedicide and other heavy metals from mining activities;
- **Improved weed management; (soft weeds)**
- **Biochar** facilitated water and nutrients retention of the crop land over long period and make it available to the plants;.

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



Biochar prevents certain soil and plant diseases



Biochar prevents army worm diseases



Biofertilizer removes soil born diseases such as
Nematodes

Biochar and water retention

No biochar treatment
Manure treatment



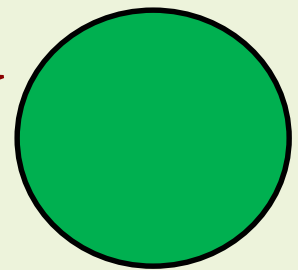
Biofertilizer treated soil



Two farms with the same boundary, Pawpaw variety, planting time. **Biochar retains water and nutrient over long period of time and make it available to the plant.**

INTERNATIONAL RECOGNITION

- Evaluated (Dec 2016)
by FAO-Rome as the
best IFES for Africa



Thank You

Email: asainitiative@yahoo.com phone:
+233244631848 ; skype: asainitiative
info.africabiocharpartnership@gmail.com

