



BIOCHHAR
ENGINEERING

Biochar equipment and material- A practical perspective from Biochar Engineering Corporation

Feb, 2011- Colorado

Clonah Gilleviner subtitle style
Jonah@Biocharengineering.com



BIOCHAR
ENGINEERING

BEC, INC.

831 Pine Ridge Road Golden, Colorado 80403

+1.303.279.9400

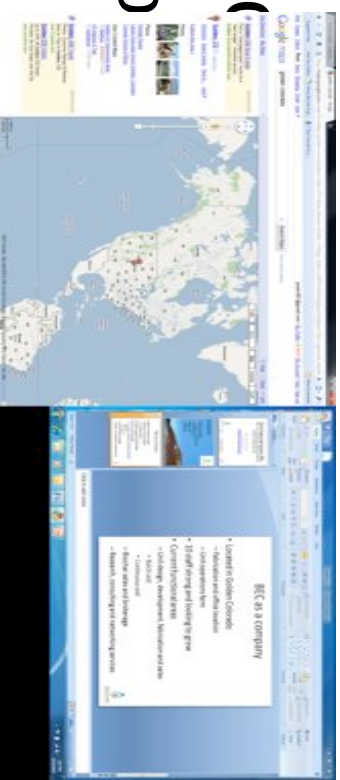
Agenda:

- BEC as a company
- Biochar production
- Biochar utilization
- Questions



BEC as a company

- Located in Golden Colorado
 - Fabrication and office location
 - Unit operations farm
- 10 staff strong and looking to grow
- Current functional areas
 - Unit design, development, fabrication and sales
 - Batch unit
 - Continuous unit
 - Biochar sales and brokerage
 - Research, consulting and networking service:



Biochar Production

BIG IDEA → Heat biomass in a way that leaves behind CARBON and drives out as much other stuff as possible

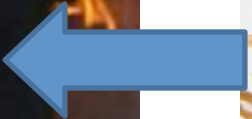


EXAMPLE

wood [or a match stick] is mostly carbon, hydrogen, and oxygen- burning the match stick drives off some percentage of all three elements but leaves the highest percentage of Carbon behind (relative to the three options).

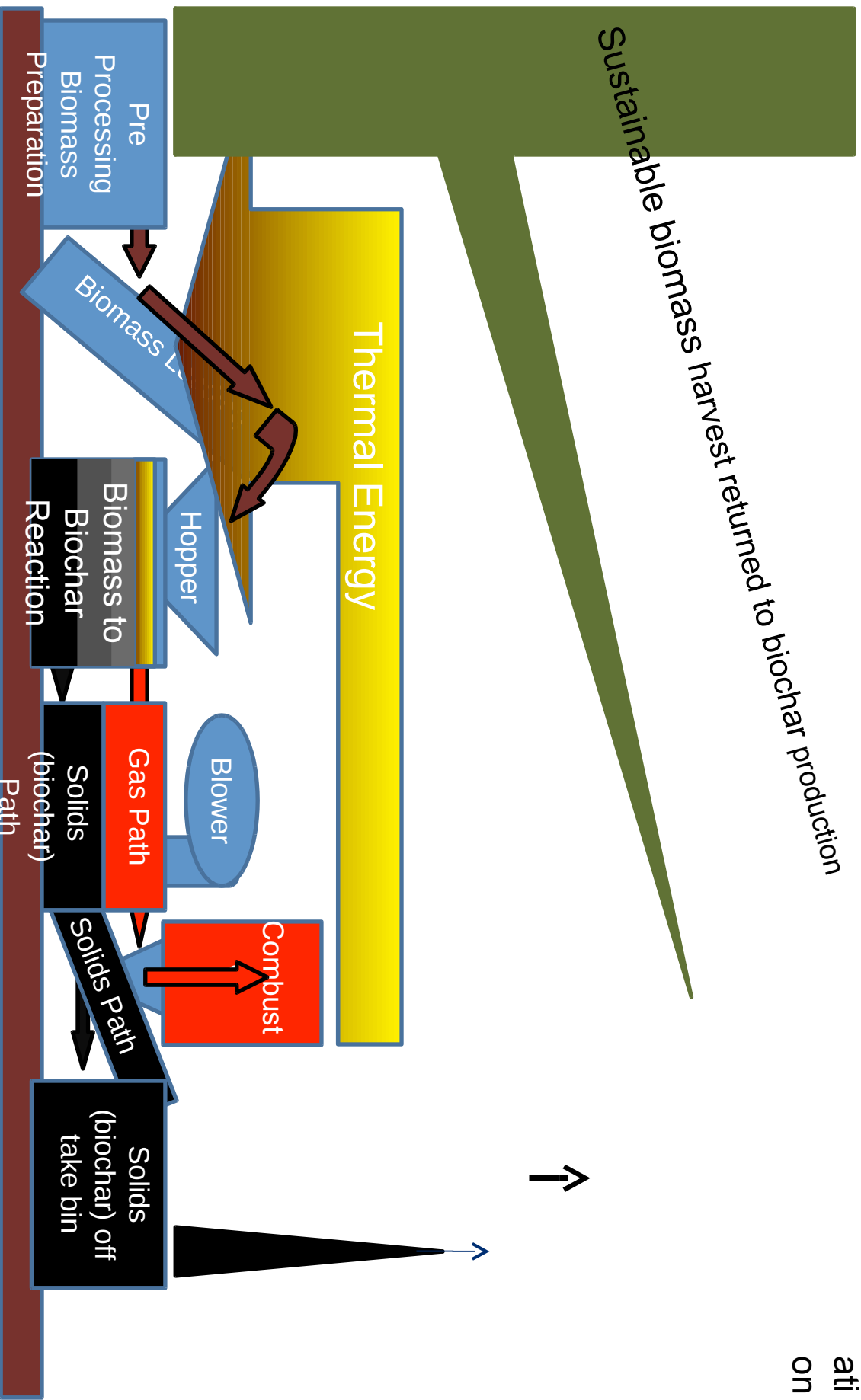
Biochar Production

How do we scale up from



Biochar Production

Biochar Application



Biochar Production



Biochar Production

Inputs						
<i>Item</i>	<i>Value</i>	<i>Unit</i>				
woodchips	500	lbs/hr	One to two cubic yards			
Electric	10	KW	Range of 8 to 16 KW-h			
Propane	0.25	lbs/hr	Used primarily at start up and shut down			
Output						
<i>Item</i>	<i>Value</i>	<i>Unit</i>				
biochar	75	lbs/hr	Range of 50-100lbs/hr			
Syngas	1.8	MMBTU/hr	500 kW thermal equivalent			

Thermal value description – 40-50 BTU needed per square foot in Colorado, 100,000 BTU/hr needed for a 2000 square foot home.

1.8 MMBTU could heat 18 {very conservative}

Biochar application description - .5 to 20 ton per acre usage, at 75 lbs/hr 26 hours of production make 1 ton, So 13 – 533 hours of production are needed per 1 acre project

Biochar Utilization

Why use biochar?

Initially when biochar is applied one will see increase soil performance due to an improvement in structure.

This improvement may increase water holding capacity, decrease leaching, facilitate great utilization from mineral and nutrient additions

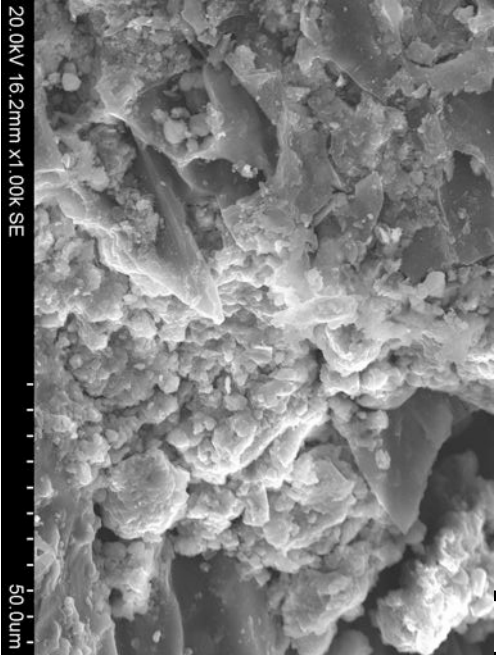
Example – Like VERMICULITE (but lasts forever, is organic, and sequesters carbon)

Overtime the structure combined with increased water, mineral, and nutrient should encourage healthier biology including bacteria, fungi, and in general healthier soil biology.

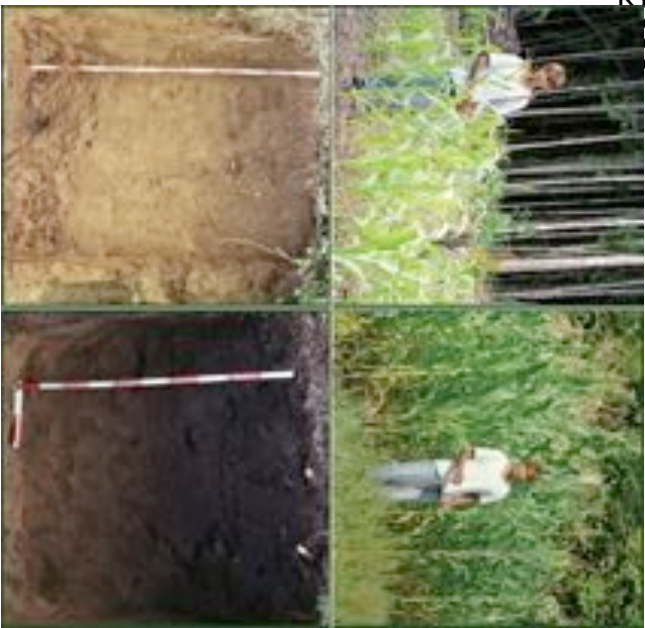
Example – Like a Coral Reef Encouraging Aquatic life

Biochar Utilization -

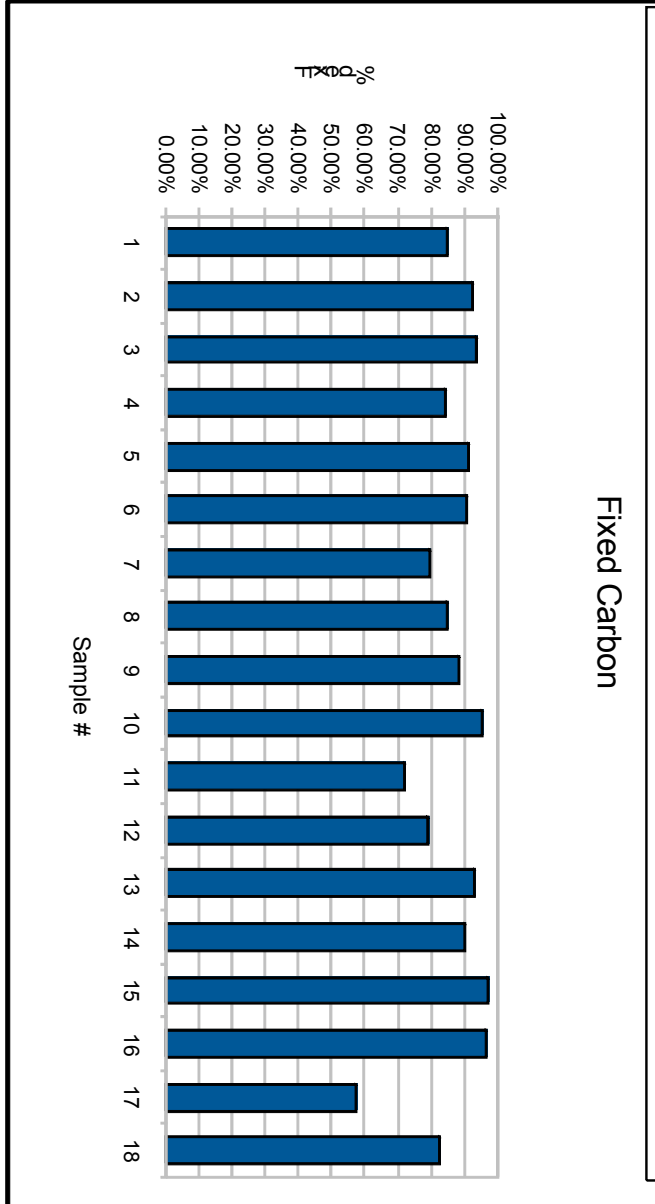
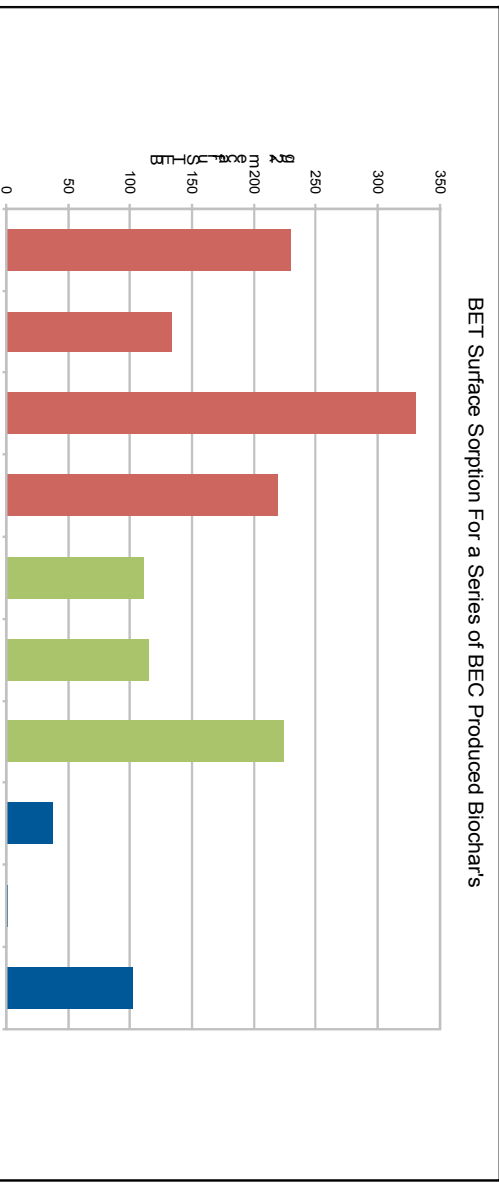
Characteristics



Electron Microscope Image of MSW Woody Char – Photo credit – S Joseph,



2



Biochar Utilization

How do I use biochar?

MIX IT, Biochar provides structure

and leverages water and nutrients

----- BUT it needs water and nutrients

➤ **≈ 5-25% biochar addition to chicken bedding**

➤ **This will absorb N, control moisture and smell**



Continuous Unit

INPUTS

Up to 500 lbs/hr (225kg/hr) woodchips, or pelletized agricultural waste, with 10% or less moisture on a dry weight basis. Maximum moisture 23%.

10 kW electric power, 12 kW at startup, 208v 3-phase, or 240v single-phase. 1/4lb/hr propane for flare pilot.

OUTPUTS

Up to 125 lbs/hr (50 kg/hr) Biochar

Fixed Carbon: 90-99%

(characterized by Soil Control Lab)

Adsorption: 100-230m²/g BET surface

pH: 7.5-10 (characterized by USGS)

Up to 1.5 million BTU/hr (440 kW/hr) thermal energy from producer gas.



DIMENSIONS & WEIGHT

5' x 18' x 10' (1.5m x 5.5m x 3m)

2.5 tons (2.2 metric tonnes) empty

Batch Unit

INPUTS

Wood or agricultural residues. Both pine woodchips and straw have been successfully tested in the system.

Approx. 75W 110v electric power

Other material will likely run well in the machine, but BEC recommends testing each feedstock to confirm successful operation. BEC can provide testing and research services to clients as needed.

OUTPUT

Approx 5 kg/hr biochar, 20-25wt% yield

CONSTRUCTION

Heavy gauge double stainless steel with an interior aluminium heat shield.



Thank You

