BIOCHAR
ENGINEERING

Biochar Engineering Corp makes modular equipment that produces ***biochar,*** a carbon-sequestering charcoal soil amendment, from waste biomass. Future systems will also produce ***carbon-negative energy****,* generating heat, electricity and ultimately liquid fuels, on-site.

Jim Fournier, President
303-279-3776 jim@biocharenergy.com

BIOCHAR
ENGINEERING

# Challenge: Climate, Energy & Soils

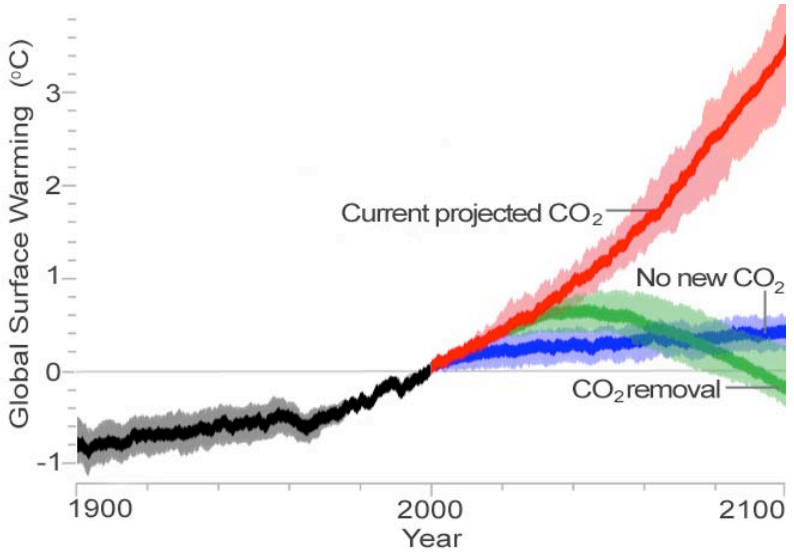
*"We will have to take the $CO_2$ level down to 350ppm or less."*
*NASA Chief Climate Scientist Dr. James Hansen*

The UN IPCC now predicts 3.5°C of warming by 2100; even if we enact all proposals currently under discussion.

Even 2°C risks civilization.

We are adding 4.6 Gigatons per year (Gt/yr) of net atmospheric Carbon.

We need to take emissions to zero, and then *remove* 100's Gt of Carbon!

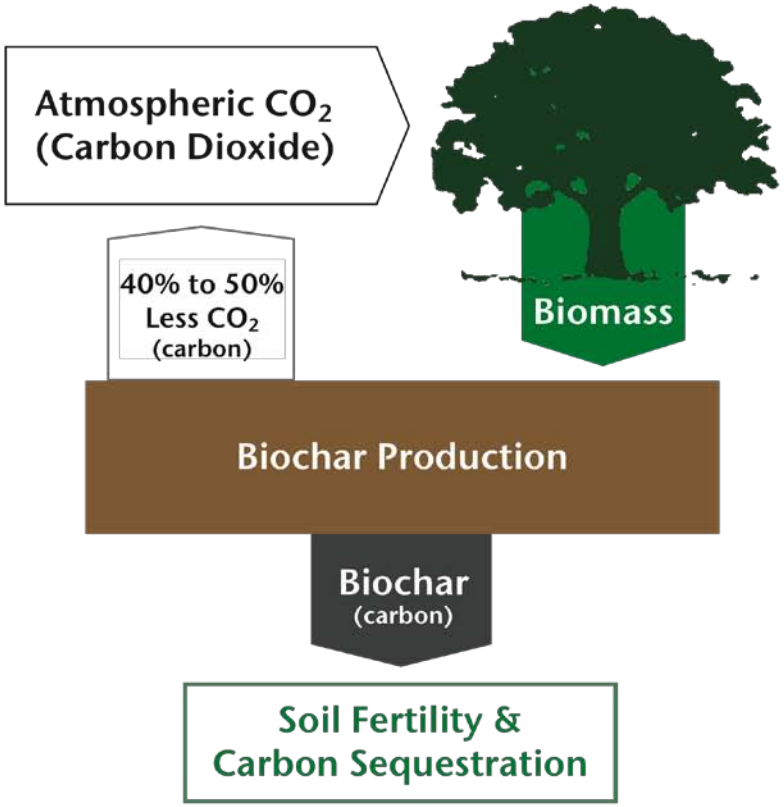



Global Temperature vs. Time



BIOCHAR ENGINEERING

# Biochar is *Carbon Negative*




The Biochar cycle *removes* net Carbon from the atmosphere.

Biochar sequesters over 40% of the Carbon from biomass for 1,000 years.

Deployed globally, biochar with energy co-production from residual agricultural waste can remove at least 1-Gt/year of Carbon, & avoid another 1-Gt/year from fossil energy.

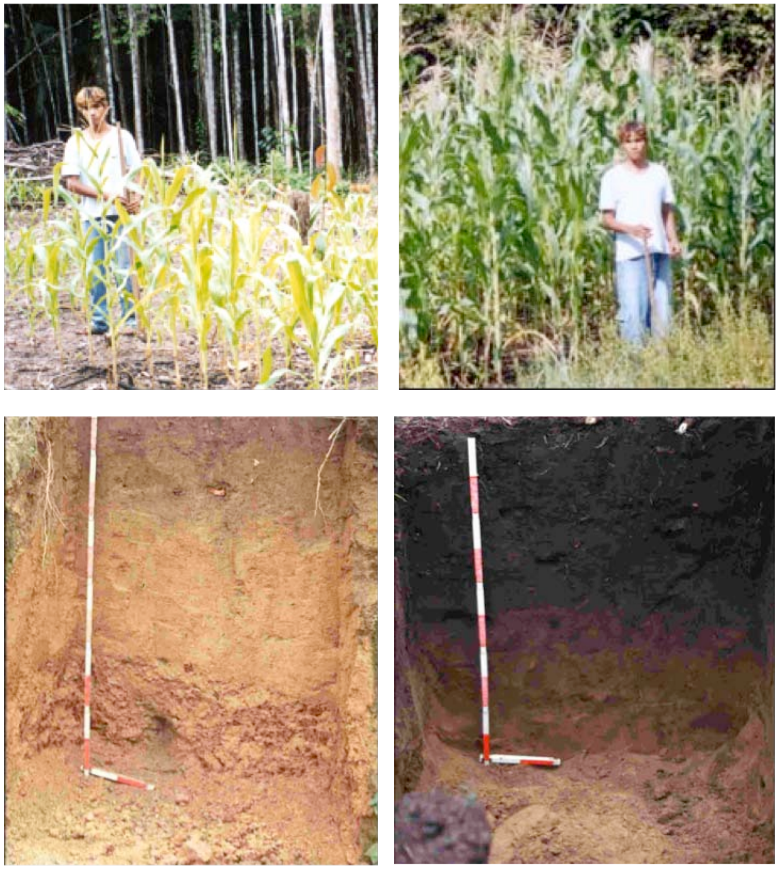
The Carbon in Biochar is equivalent to about 3 times its weight in $CO_2$.



BIOCHAR ENGINEERING

# Biochar Improves Soil Fertility

- Inspired by Terra Preta Soils in the Amazon Basin
- Produced by Heating Biomass with Limited Oxygen
- Increases Crop Yield 10-200%
- Reduces Nitrogen up to 80%
- Increases Water Holding & Drought Resistance
- Increases Cat-Ion Exchange
- Improves Soil pH



Regular Soil Terra Preta

International Biochar Initiative

BIOCHAR ENGINEERING

# Biochar Value Streams

## 1. Soil Fertility

Agriculture

Forest Management

Remediation

## 2. Energy

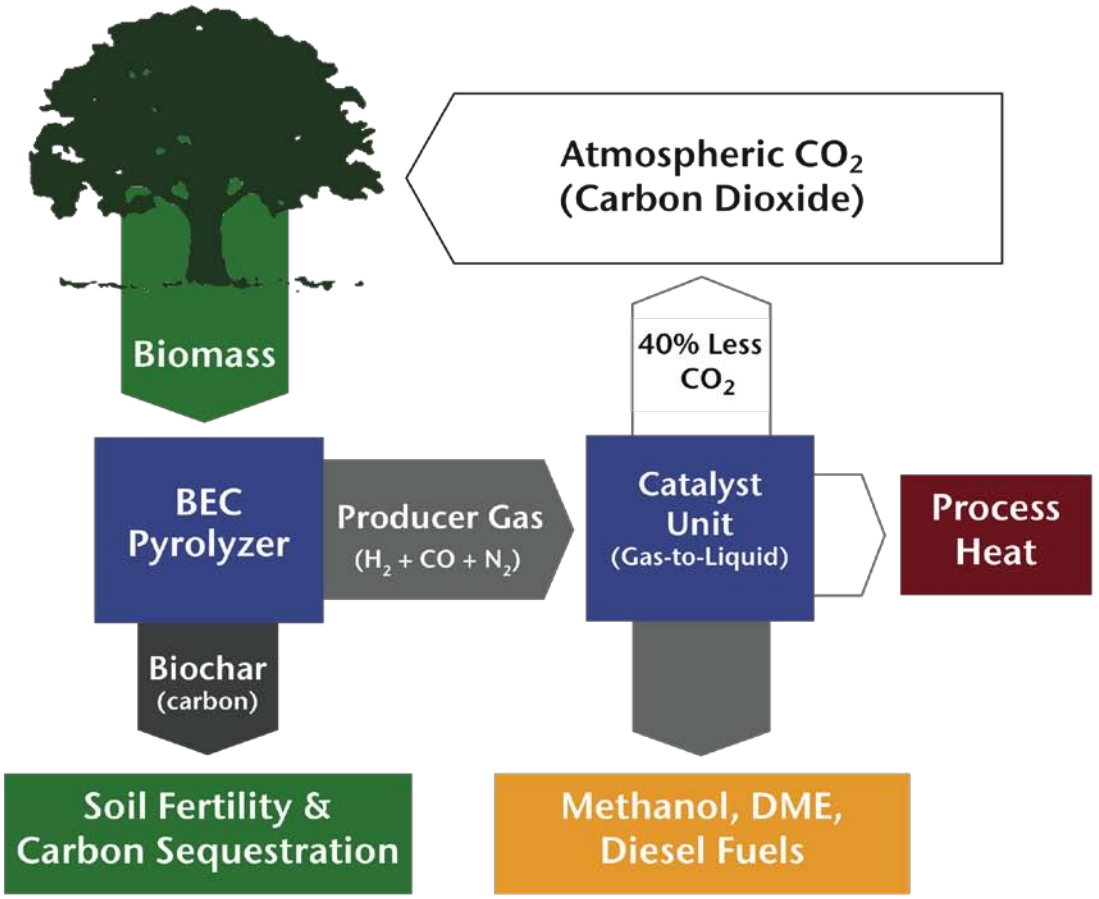
Process Heat

Electricity

Liquid Fuels

## 3. Sequestration

Carbon Credits






BIOCHAR ENGINEERING

# Current Value Streams

## 1. Soil Fertility

Agriculture: $200 to $2,000/mt of biochar; niche markets in US

Forest Management: Pine Beetle mitigation, avoided air emissions

Remediation: Mine lands, oil & gas; research, proof of concept

## 2. Energy

Process Heat: Propane cost offset can pay for system

Electricity: Still too expensive for US market; green tags coming

Liquid Fuels: Very attractive in US, but several years out

## 3. Sequestration

Carbon Credits: $10 to $50/mt of biochar

## 4. Tipping Fees

Avoided disposal cost for Green Waste = big early driver



BIOCHAR ENGINEERING

# BEC Technology

## Safe, Simple, Reliable, Cost-Effective

Low Temperature Gasification - Direct-Contact Pyrolysis


Open-air process: no risk of explosion

Produces biochar at the lowest capital cost in continuous field-scale systems

Biochar produced has low volatile content; high surface activity; good adsorption



BIOCHAR ENGINEERING

# Modular Systems


## Field-deployable

Containerized Systems

Minimize Transport of
both Biomass and Biochar

Automated Operation to Minimize Labor

Distributed Manufacturing to Maximize Political Support

## Liquid Fuel Production

BEC is working on a biomass-to-liquid fuel module that will produce methanol, DME, and ultimately ammonia, at field-scale using a novel, low-cost, nitrogen-tolerant, catalyst system already developed for stranded natural gas.



BIOCHAR ENGINEERING