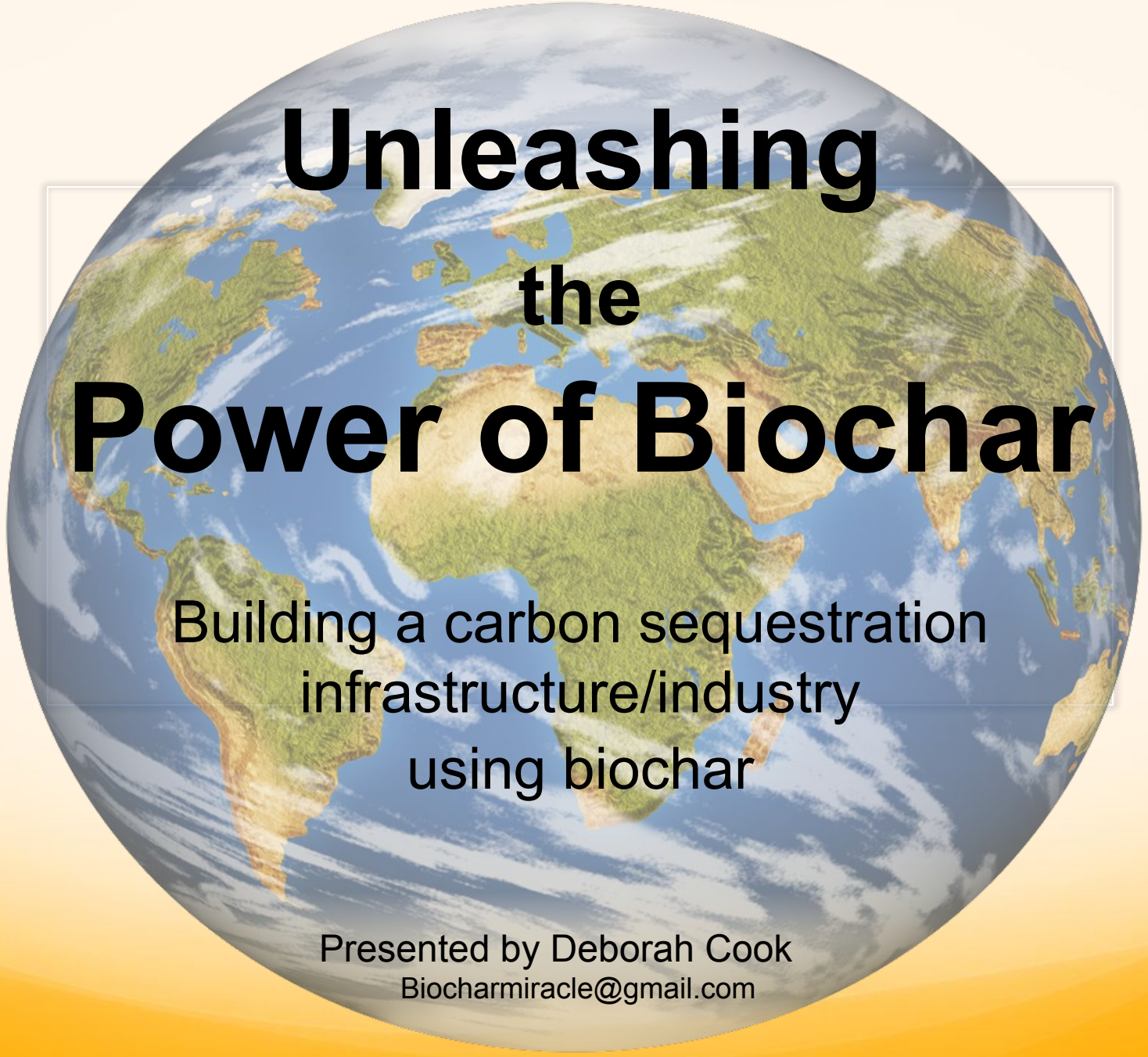

Unleashing the Power of Biochar

Building a carbon sequestration infrastructure/industry using biochar

Presented by Deborah Cook
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We have just **11 years** to stop runaway climate change

U.N. Intergovernmental Panel on Climate Change 2018 report

(6,000 scientific studies referenced in report)

Each year humans emit 30 – 40 billion tons of CO_2 …

… And we are running out of places for the excess carbon to go

- Oceans: heating rapidly and acidifying

  Absorbing 5 Hiroshima bombs of heat per second since 1990 – Nat'l Center for Atmospheric Research

- Forests:

  Planting the entire U.S. with trees (1.7 billion acres) would only absorb 10% of CO2 and temperatures would still rise 3.6 degrees

SCIENTISTS SAY THE BEST PLACE TO SEQUESTER CARBON IS IN THE SOIL!

THERE IS A WAY!

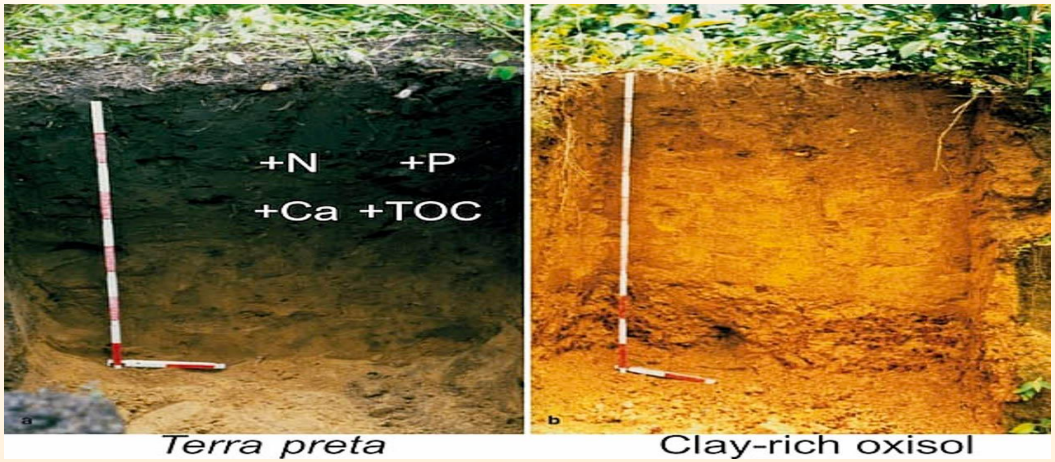
A 2500 year-old
PROVEN TECHNOLOGY

BIOCHAR

99% pure carbon • Stable for millennia

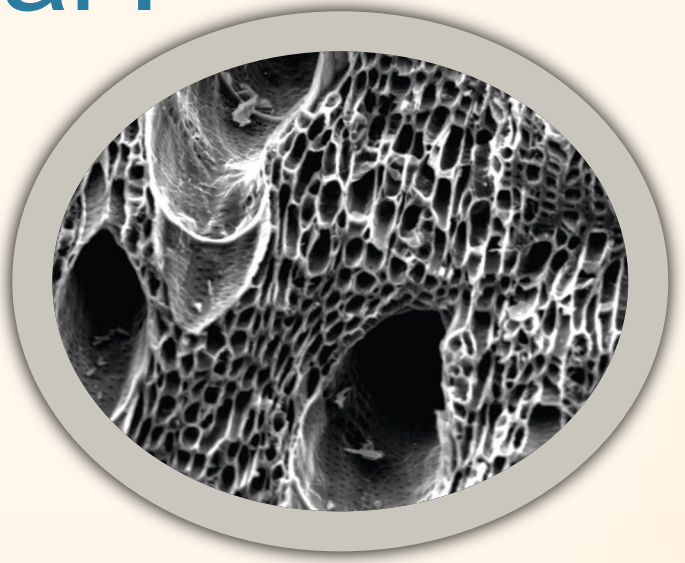
Biochar was invented 2,500 years ago in the Amazon

- Allowed Amazon River Basin to support millions of people in spite of extremely unfertile soil



- Man-made **biochar** was KEY INGREDIENT in Terra Preta – the famous Amazonian fertile soil
- Ancient Terra Preta with **biochar** persists today

What is biochar?



A solid, stable form of carbon filled with a honeycomb of pores

BIOCHAR CAN:

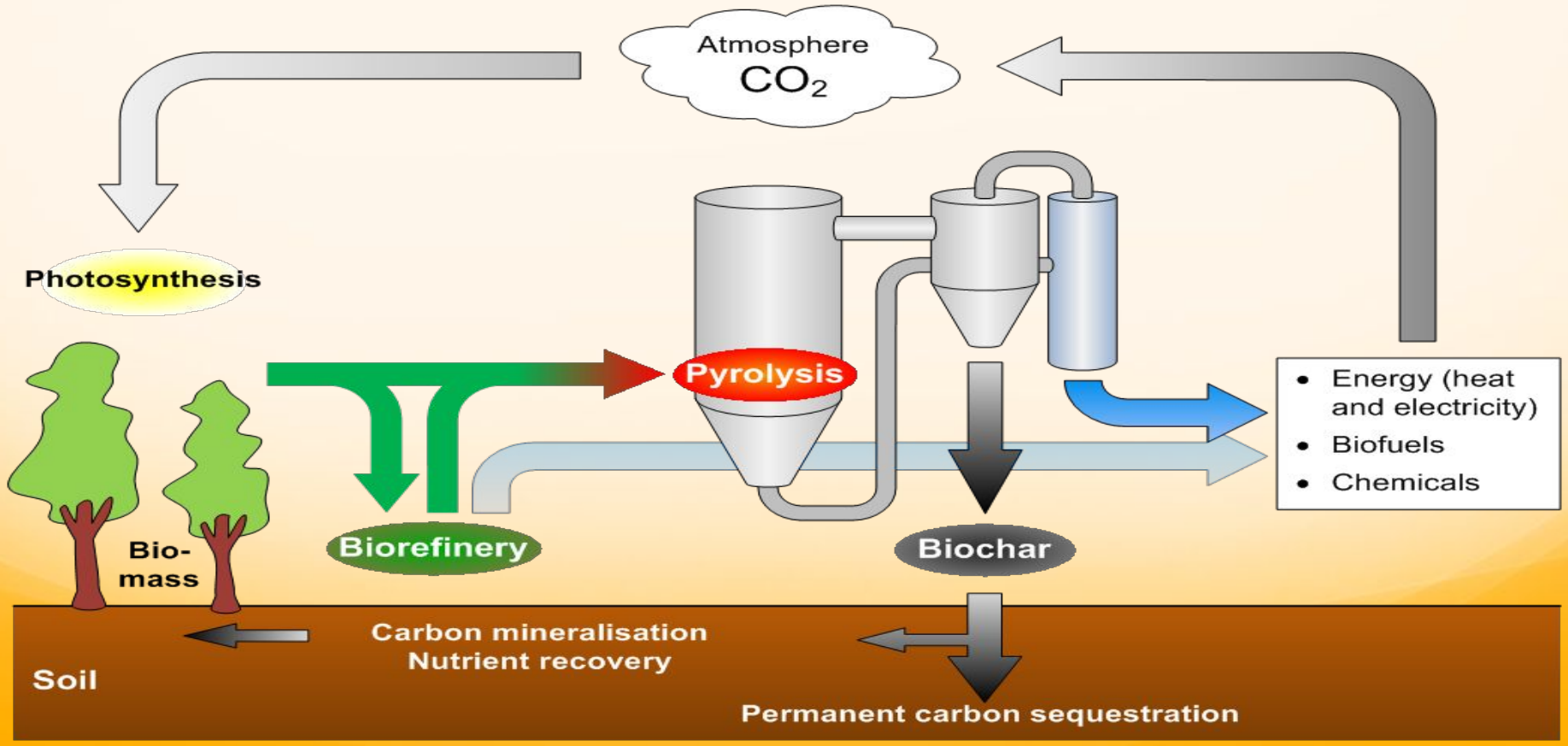
- *Store huge amounts of water* ➡ ***fights drought***
- *Provide shelter for microbes* ➡ *rapid microbe growth* ➡ ***increased soil fertility***

Imagine: the pore surface area of 1 gram of biochar can cover 2 tennis courts

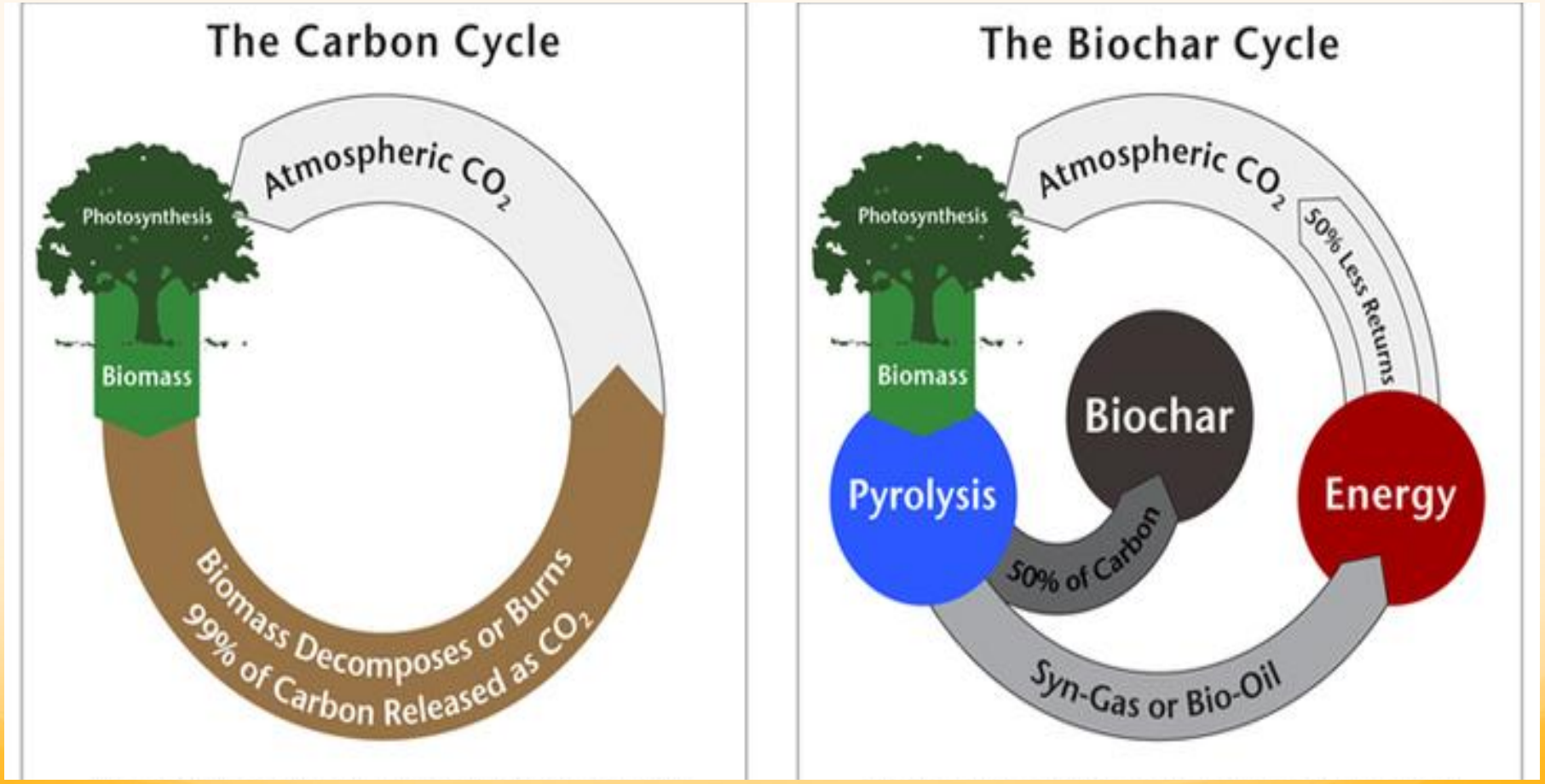
Biochar is man-made

Process called PYROLYSIS
Burning organic material at high heat without oxygen

Added benefits: creates valuable by-products - **heat, syngas, bio-oil**.



How biochar takes carbon out of the atmosphere



Pyrolysis converts 50% of carbon into a permanent, solid state

Biochar can be made at different scales

FROM A SIMPLE STOVE TO A SOPHISTICATED RETORT

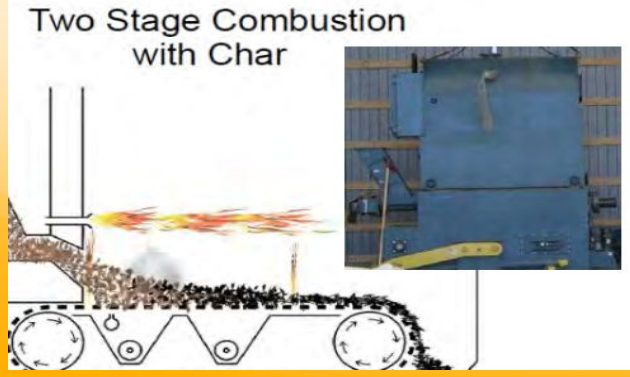
A. Transportable – can move to sources of biomass (hurricanes, tree blights and infestations, invasive species removal)

B. Stationary – can heat buildings and provide by-products (bio-oil, syngas)

BioChar TLUD Cook Stove
Seachar.org

Greenhouse scale heat and biochar NE Biochar 1 t/10h

Mobile Pyrolysis
Black is Green (BIG) AUS



A Few Expert Opinions

"Biochar can be used to address some of the most urgent environmental problems of our time—soil degradation, food insecurity, water pollution from agrichemicals, and climate change."

Dr. Johannes Lehmann, Cornell University, Chairman of The International Biochar Initiative Board of Directors

"Biochar can be used to restore soil fertility while storing carbon for centuries to millennia"

Dr. James Hansen, Columbia University, Director of NASA's Goddard Institute of Space Studies

"If you could continually turn a lot of organic material into biochar, you could, over time, reverse the history of the last two hundred years."

Prof. Bill McKibben, Middlebury College, Founder of 350.org

"It has been found that, with some soils and crops, productivity can be increased eight-fold. For the atmosphere that's a treble whammy – fossil fuel left in the ground, stable biochar carbon in the soil, plus increased labile carbon bound up in the life-cycle of the greater weight of crops and their in-soil roots."

Dr. Peter Read, Massey University, International Biochar Initiative Board Member

Amazing fact….

One lb of BIOCHAR
removes
3.7 lbs CO_2
from the atmosphere

And locks it in the earth where it works magic!

Biochar on a grand scale…

One retort making 900 lbs. of biochar per hour removes

3330 lbs. of CO_2 per hour!

100 retorts across the country could remove

666M lbs.* of CO_2 per year!

*Based on operating only 8 hrs /day for 5 days/wk for 50 weeks

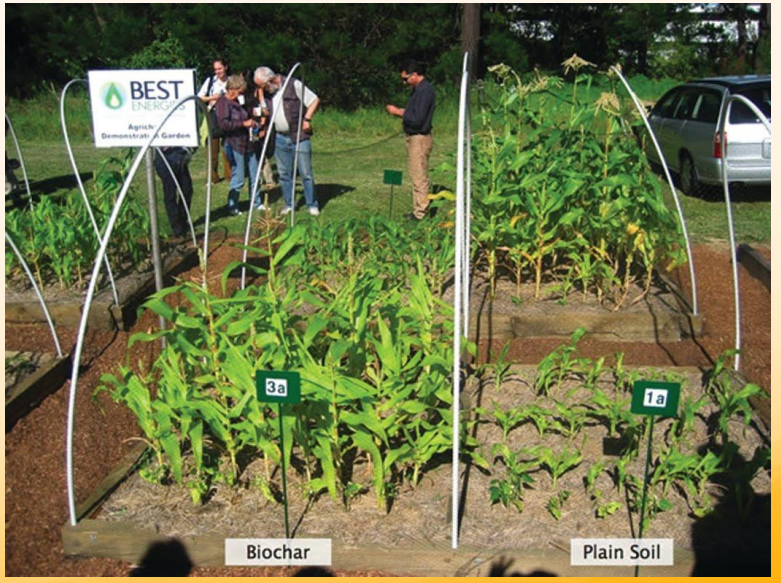
Biochar in the soil works miracles too!

"A True Miracle"

Kelby Fite – Lead researcher

Bartlett Tree Experts (caretakers of Arlington National Cemetery)

- Fights drought
- Increases soil fertility
- Improves plant health
- Cleans up toxins



Biochar has powerful economic benefits too..

- Increases agricultural output – soil fertility, plant growth, drought-fighter
- Creates good paying, long-term jobs, particularly in rural areas
- Generates valuable by-products – heat, syngas, biofuels
- Spawns new businesses – toxic waste removal, stormwater remediation, animal feed, and many other commercial applications

Barriers

So why hasn't biochar gained traction yet?

- Lack of knowledge = no demand
- Lack of supply – high cost of entry (equipment + uncertain market)
- Need for regionalization – transporting raw materials or biochar long distances would negate biochar's value for carbon sequestration
- Raw material availability – use local diseased or damaged stock, invasive plants, etc.--- *not living plant stock*
- Application is complex – biochar is so powerful that it needs to be treated before it is applied, customized process

Biochar is a local solution!

Overcoming obstacles & harnessing the power of biochar NOW!

There's no time to wait for market forces to build, or a carbon tax, or …(any excuse)!

Let's build 100 retorts across the US with 2 trained staff, to make, educate and distribute biochar…

Let's create an entire new industry from the top down.

A Blueprint for Quick Action

- Raise $$$ to build 100 retorts & 2 trained staff (2 retorts/state) to start
- Create a national non-profit organization to oversee program
  - Manage funds
  - Choose type & sites for retorts
  - Train staff
  - Work on legislative issues…
- Utilize technical assistance

Funding Sources

A. Oil, gas and energy companies that have contributed to the CO_2 in the atmosphere

B. Private investors and philanthropists

Kickstart Committee

A small group of public and private sector leaders

- 2 or 3 influential legislators
- 2 or 3 influential business leaders

Responsibilities: Procure funding & set up non-profit

Blueprint Review

- Establish Kickstart Committee of legislators and business leaders
- Procure $$$ & pledges for future funding
- Set up non-profit – Oversees site selection for retorts, staff training, finances, oversight, legislation
- Establish 100 retorts in 50 states, staffed with at least two trained professionals to make, distribute & educate about biochar
- Expand program - Increase number of retorts and develop revenue-generating opportunities

Building from the top down **KICKSTARTS** the biochar industry

Build **supply** first, then **demand**! Just the opposite of other industries! Biochar is unique!

- A steady **supply** will spawn consumer demand and new businesses (ex. packaging and selling for garden centers or delivering for toxic waste removal projects).
- Investors won't have to worry about trying to build **demand** fast enough to pay off their huge capital investments.

The biggest winner is our environment!

Biochar is the gift that keeps giving… **LET'S USE IT!**

- Increases agricultural output, soil fertility & plant health
- Fights drought
- Makes valuable by-products - syn-gas, bio-oil, heat
- Creates good-paying jobs & spawns new businesses
- And **COMBATS CLIMATE CHANGE…**

We have 11 years

Biochar – Our Very Best Hope

We CAN build a carbon sequestration infrastructure in time