Bringing Farmers to Biochar
language, logistics & economics
to get growers engaged

Illinois Biochar Association
Friday, November 14, 2014

Phil Blom
Terra Char, Columbia, MO
www.terra-char.com

Farmland is an ultimate carbon sink, final resting place for biochar
Farmers must be convinced to buy & try biochar in their soils
Enlisting growers is more than advertising and promotion
Farmers are equal partners to develop biochar uses
Creative collaboration is the key to integrate biochar into farming.
Terra Char

new business, new product, new industry

Agricultural Mission

Biochar, BioEnergy, Biolizers, Technology

Location & Facilities

Products

Staff

Goals

www.terra-char.com

TerraChar’ge

your soil battery

Kit

fully fertile soil

carbon-smart crops

nutrient-dense food

carbon, minerals & microbes

5 gallons

24 pounds

Columbia, MD
Introduction to Farmer Communication

Three Reality Checks when talking to a farmer

Finances & Money = profitability
make money by saving money

Increase Carbon stores, sinks & cycles
money in your soil bank (and water, too!)

Boost Soil Life: microbes & Soil Food Web
dirt is inert, but soil is alive
#1 Assure Success
1. sell a sure thing
2. charge with minerals & micronutrients
3. colonize by microbes

#2 Assure Profit
1. increase yields
2. decrease costs
3. premium price for quality

#3 Solve Problems & Fill Niches
1. convert wastes into resources
2. save money by reduced expenses
3. add value to farm products

#4 Easy Operation & Application
1. full function products
2. pre-blend ingredients
3. one pass application
4. easy storage, handling, preparation
**Application**
integrate into farm operations & equipment logistics of soil applications
  broadcast, band, spray, drench, inject
clear instructions for each crop & method

**Productivity**
use less fertilizer & reduce costs
increase fertilizer efficiency
reduce nutrient leaching & loss (non-point pollution)
gradual transition to sustainable systems: 5 years
integrate with other carbon-smart practices
make biochar affordable
make biochar convenient
Farmer Education & Training
- teaching farmers & ranchers new materials & methods
- create small test plots (TerraChar’ge Kits = 100 sq.ft.)
- special problems handling living cultures

Handling & Equipment
- every farm is unique
- adapt equipment to blend & apply biochar
- how to apply to large acreages

Preparation
- **The 4 M’s**: inoculation & handling protocols

Blending
- with minerals, microbes & compost (dry ingredients)
- with inoculants, metabolites & water (wet ingredients)

Placement Methods & Strategies
- broadcast on soil surface, till into root zone
- band in seedling root zone, with starter nutrients & microbes
- shelter under soil surface, or cover with thick mulch
- injection as slurry, with nutrients & microbes
**Application Rates**

<table>
<thead>
<tr>
<th></th>
<th>1 quart gal/100 sq.ft.</th>
<th>1 pound tons/acre</th>
<th>6-inch tillage % of soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>optimum</td>
<td>18.7</td>
<td>16.3</td>
<td>5.0</td>
</tr>
<tr>
<td>gradual</td>
<td>3.7</td>
<td>3.3</td>
<td>1.0</td>
</tr>
<tr>
<td>minimum</td>
<td>1.8</td>
<td>1.6</td>
<td>.5</td>
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</tbody>
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**How much Biocarbon?**

2% minimum

4 - 5% certified organic

10% optimum

5% biochar (stable)

5% compost (mobile)

**gradual:** 3.3 tons/acre/year (1%) for 5 years to reach 5% optimum

**minimum:** 1.8 gallons/100 sq.ft. (.5%) for 10 years to reach 5% optimum

for quick response & sure success with minimal amounts:

1. **Charge** with mineral ions & micronutrients
2. **Inoculate** with microbes & metabolites
3. **Incubate** thru two microbial population explosions
Vegetable & Fruit Farms

Quickly improve soil structure, tilth & texture
Media to hold, carry & deliver nutrients
Increase fertilizer efficiency & efficiency
Target applications for active root zone
Integrate into standard farm operations
Use of existing farm equipment
Biochar and Compost partnership

Biochar Trials
MU Bradford Research Center, Columbia

2013 Trial: Tomatoes
50% greater yield

2014 Trials: Tomatoes, Vegetables
Corn, Soybeans
Compost

Paul Lais
Ozark Mountain Orchard
Composts, mulches, SEA-90, Terra Char
Inoculants, metabolites, rockdusts, humates
Structured Water (Greenfield Natural)
Strawberries & Raspberries in hoop house leaves twice normal size earliest fruit ever.

Carbon-Smart Farming
fruit, fiber & fuel for the 21st century
new methods & materials for Sustainable Agriculture
Paul Lais, Doug Brethower & David Yarrow
Saturday, October 4
Ozark Mountain Orchard
2949 Pleasant View Road, Highlandville, MO from Highlandville: US 160 south, west on V, north on Pleasant View Road
www.oazarkmountainorchard.com
www.facebook.com/oazarkmountainorchard

Ozark Mountain Orchard uses new technology & strategy to improve soil fertility, crop quality & farm profitability. Join one day of show ’n tell to learn new ideas for climate-smart, biological, sustainable, community-centered agriculture

- Biochar & Soil Carbon
- Soil Mineral Balancing
- Soil Microbe Inoculation
- Bioenergy from Biomass
- Structured, Energized Water
- High Tunnels for 4-Season Food
- Community Friendly Agriculture
- LIFE = Locally Integrated Food & Energy

$10 donation includes lunch family discounts

to register:
Paul Lais
417-225-2254
info@ozarkmountainorchard.com
for information:
www.dyarrow.org/CarbonSmart

Carbon Creates Community
It’s impossible to contemplate the life of soil very long without seeing its analogy to the life of spirit.

— Wendell Berry
The Unsettling of America: Culture & Agriculture
Soybean Farms

Buckman Farm 2014
5 of 65 acres, no fertilizer
SumaGrow + SEA-90 + Terra Char powder
sprayed once at planting
Effects on yield
size of plants
extent of root growth
nodules with Rhizobia bacteria
number of pods per plant
size of soybeans

Plans for 2015

Getting the Word Out
to more growers
Literature: telling stories
Videos (youtube)
Farm Field Days: show 'n tell
Grower Gatherings
News & Magazine Articles
TerraChar’ge Kits: 100 sq ft. test plots

Buckman Soybeans
Columbia, Missouri
October 2014
Add to Litter

odor control: ammonia adsorption
fertilizer booster: Nitrogen & Phosphorus capture & retention
microbial catalyst: improve digestive efficiency

Biochar Production as Heat Source

Chris Halliday, Missouri poultry farmer
Roger Reed, civil engineer, 30 years experience
produce biochar from sawdust to use for odor control

Poultry Manure as Feedstock

Josh Frye, West Virginia

Biochar as Feed Supplement

Birds like to eat biochar
Dr. Casey Ritz, Georgia University
activated carbon vs. biochar

winter conference
Biochar in Poultry Farming
Missouri University, Columbia
Feeding My Chickens Natural Charcoal
by JP Daugherty

I feed my chickens charcoal made in a woodstove that heats my house in winter in northeast MO. While browsing amendments to chicken litter, I read a scientist found charcoal added to chicken manure decreased ammonia by conversion to more stable ammonium...... feed supplemented with 1-3% biochar.

Feeding chickens charcoal improves litter as fertilizer
by Stephanie Schupska
Univ. of GA Southeast Farm Press

When charcoal is used in chicken feed, bacteria in manure convert uric acid to ammonium, not ammonia. This makes litter less odorous or harmful, and can make litter a better nitrogen fertilizer for crops, too.

Biochar in Poultry Farming
by Henning Gerlach & Hans-Peter Schmidt

Poultry industry disease struggles often trace to microbial pathogens & ammonia in litter. Adding biochar reduces toxic ammonia, regulates litter moisture. Biting coop odor & footpad dermatitis remedied in days.

Litter-Generated Ammonia Captured by Activated Carbon Derived from Broiler Litter
by K.Brisolara, D.Miles, L.Lima

Abstract

2011 broiler production was 8.6 billion, valued at $23.2 billion. Report required for ammonia (NH3) emission of 18.3 tons/year. Industry must reduce NH3 from broiler farms. Studies shows BAC can adsorb NH3 double commercial carbon. 3-day test: NH3 emission 75% of control.
Doc Kinkaid: Holistic Management

76-year-old veterinarian, Harrisburg, MO

Grazing Rotation: 52 paddocks, moved twice a day
Daily Supplement: Terra Char + SEA-90 (3:1) + molasses (less than 1% daily feed)
Research: methane reduction (28%), feed conversion (+20%), weight gain (+25%)

Improve pasture soil & feed quality
Improve health & productivity

Uses & Benefits

pasture regeneration: effects on roots & microbes
charred carbon in ancient prairie soils
manure management: digestive catalyst
odor control
water quality
feed supplement

Get Approval as Animal Feed

classification & regulation
American Feed Inspectors Assoc.

activated carbon vs. biochar
mineral charging
microbial inoculation

Research:

methylene reduction (28%), feed conversion (+20%), weight gain (+25%)

Improve pasture soil & feed quality
Improve health & productivity
Conclusions

To-Do List
1. what must be done now
2. who can help
3. Grower outreach, education & invitation
4. TerraChar’ge Kits to retail markets for gardens, nurseries, landscaping...
5. immediate research needs:
   - blending biochar with minerals & microbes
   - weedy biomass: cornstover, straw, switchgrass
   - farm-scale equipment for biochar, heat & power

Wish List
1. what is needed
2. how biochar community can help
3. Grower outreach & education
4. Winter Conference: Biochar in Poultry Farming
5. student interns
6. long-term applied research needs
7. product licensing & regulatory classification
8. Biochar Industry Trade Association
9. Carbon-Smart Farmers Association
10. Carbon-Smart food label