

Carbon Conservation for Home, Health, Energy & Climate

History & Industry;

The Paleoclimate Record shows, Agricultural-Geo-Engineering is responsible for 2/3rds of our excess greenhouse gases. The unintended consequence, the flowering of our civilization. Our science has now realized these consequences and has developed a more comprehensive wisdom. Wise land management, Afforestation and the Thermal Conversion of Biomass can build back our Soil Carbon. [1]

Pyrolysis, Gasification and Hydro-Thermal Carbonization are known biofuel technologies, What is new are the concomitant benefits of biochars for Soil Carbon Sequestration; building soil biodiversity & nitrogen efficiency, for in situ remediation of toxic agents, and, as a feed supplement cutting the carbon foot print of livestock. Modern systems are closed-loop with no significant emissions. The general life cycle analysis is: every 1 ton of biomass yields 1/3 ton Biochar equal to 1 ton CO₂ equivalent, plus biofuels equal to 1MWh exported electricity, so each energy cycle is 1/3 carbon negative.

Cutting edge, third generation companies, aiming for drop-in fuels, report that 1 ton of biomass yields 75 gallons of bio-gasoline and 1/3 Ton Biochar. [2]. Another pathway is production of Ammonia and Biochar from biomass, making Agriculture Fossil Free Fertilizer , [3] In combination; Farmers can be Fossil Carbon Free utilizing less than 3% of their fields.

Beyond Rectifying the Carbon Cycle:

Biochar systems Integrate nutrient management, serving the same healing function for the Nitrogen Cycle and Phosphorous Cycle.

A 50% - 74% reduction of NH₃ loss when composting [4], Ag manure char absorbs phosphorus for nutrient credit income, CHP, Biomass Crop & energy grants. When carbon comes to account, as Carbon Farming in Australia has, another big credit. In southwestern Ohio, A facility will be drying 45,000 tons of dairy manure per year, producing 3,000 tons of High Phosphorus Biochar via oxygen-starved gasification. The equipment for this project is being installed as we speak, and the facility should be fully operational in October.

Biochar feed supplements attend to the Carbon “Hoof, Paw & Fin Prints” of animal husbandry. The fostering of intestinal Wee-Beasties leads to improved husbandry metrics that run the gamut; less mortality, increased feed conversion rates, general health and product quality. In Aquaculture, with species of indeterminate growth, in shrimp, fish & clams, a doubling in size. Switzerland has 50,000 chickens and thousands of cows under carbon feed protocol, eliminating chronic botulism and manure odors. A cascading use of Biochar from silage, to cow, to compost, to field, closing the loop of nutrient management while building soil carbon.

Working to integrate the many applications of Biochar for enteric health, for mine scarred lands, as an in situ bioremediation for a host of toxic agents & pesticides, in addition to carbon negative energy, has been the most rewarding work of my life, I have networked and collaborated with a host of organizations across the globe. My goal is total symbiotic integration of nutrients, carbon and energy by the husbandry of whole new orders and kingdoms of microbial life. To recruit the Wee-Beasties from numerous biomes allows nature to do the heavy lifting, to solve many dilemmas in our macro world. There is Plenty of Room at the Bottom, and Biochar has provided the tools to explore this vast unseen realm. The Delinat Foundation, Carbon Terra and Black Carbon DK. in Europe and SuperStoneClean Biochar in Japan, are the leaders in these integrated protocols. [5]

The compounding soil benefits; reduced nitrogen loss & soil CO₂e emissions and a 17% increased water efficiency are documented in trials across soil types and climates. BlueLeaf, in Canada, has nine different trials, over the last four years, Vineyards and universities across Europe for five years, Virginia Tech now in their seventh year, the Australians are heading into their eighth year in broad acre study. [6]

Economic at all Scales:

Local economic stimulus is at all scales of development, from the Global Clean Cook Stove Alliance, to base load manure systems, to industrial biomass power production. My heroes are the engineers without Borders who have promoted clean cook stoves, Pyrolytic and Gasifying stoves that burn any biomass cleanly and 41% more efficiently. No black-lung, no emphysema, no deforestation, all the while building soil carbon for continually sustainable yields. Please look at the work of the Biomass Energy Foundation. At scale, replacement of three rocks in a pot, across Africa would have the health impact equivalent of curing malaria and AIDS combined. [7]

Beyond nutrient management, Biochar hold high value for the remediation of heavy metals, mine scarred lands and Brownfields. Biochar Solutions has been a pioneer in these applications. DuPont initiated trials after I shared with them the pertinent papers from the ISU conference. A 95% reduction of Mercury uptake into the food chain was achieved in vitro, after one year the in situ pilot study is currently showing a 50% reductions and climbing. This DuPont and Oak Ridge National Laboratory collaboration is now being expanded, when taken to full-scale, showing these promising results, we could be eating fish out of the Shenandoah River within the decade.

The Major Endorsements include:

Dr. Jim Hansen, Head of atmospheric science at NASA [8]

Dr. James Lovelock, The Father of Gaia theory says Biochar is the only hope that mankind can avoid disastrous climate change

Dr. Rattan Lal, at OSU, the most cited soil scientist in the universe. Personally, the one most rewarding moment of the year for me was after returning from my talk to Commission for Environmental Cooperation, to the EPA Directors from the US, Canada and Mexico. I sent the text to the Climate Change Office at DOE with a copy to Dr. Lal, he replied to me with thanks and was impressed, commending me on conceptualizing & articulating the concept; "The Establishment of Soil Carbon as the Universal Measure of Sustainability." Your humble gardener was On cloud 9 for weeks.

Nobel laureates; Al Gore and Dr. Mario Molina, Savior of the Ozone layer

Politicians; Tony Blair in the UK, Tony Abbott, the conservative party leader in Australia, Secretaries Salazar & Vilsack,

Environmentalists; Tim Flannery, Bill McKibben, Dr. Vandana Shiva, Dr. Elaine Ingham, mother of the soil food web and head agronomist at the Rodale Institute, Richard Branson & his Carbon War Room.

A Carbon-Based Religion

Carl Sagan's human connection to stardust leaves out a critical stage. We are stardust, but only stardust transformed by life. Every time I look at the SEMs of Char, it strikes me, the perfect preservation of the base structures of life, a fractal vision, how life creates the greatest surface area with the least amount of material. The preservation of this structure, for return to the lowest order of life, seems almost a religious act. A perfect cradle to cradle recycling, biotic carbon should never be combusted and destroyed, but revered, as life is revered, to be returned to the cradle of terrestrial life, the Soil. In this Carbon based religion Burning is not the consequence OF Sin, Burning is the Sin.

This view of biologic carbon has led me to compose several paraphrases; "The Terra Preta prayer"; Our carbon who art in heaven, "The soil carbon Commandments"; Thou shall not have any molecule before me, and the "Soil Carbon Dream"; I have a dream that one day we live in a nation where progress will not be judged by the production yields of our fields, but by the color of their soils and by the Carbon content of their character. Google them to read the rest.

The photosynthetic "capture" collectors are up and running all around us, the "storage" sink is in operation just under our feet, conversion reactors are the only infrastructure we need to build out. Carbon, as the center of life, has high value to recapitalize our soils. Yielding nutrient dense foods and Biofuels, paying premiums of pollution abatement and toxic remediation and the

growing dividends created by the increasing biomass of a thriving soil community.

If CoolPlanet Biofuels processed the entire biomass harvest in the US, 1.6 Billion Tons, the yields would be;

120 Billion Gallons of tank ready fuel , The US uses 150 Billion gallons per year

0.3 Billion Tons of Biochar

The big numbers are jaw dropping,

That 0.3 Billion Tons of Biochar, with a surface area of 600 M²/gram means; One Ton has a surface area of 148,000 Acres!

Now for conversion fun: 148,000 Acres is equal to 230 square miles!!

So; 300 Million Tons of Biochar equals 69 Billion Square Miles, or 348 times the entire surface of the earth!

If I May be so bold,... As I speak for Biologic Carbon... I speak for the very center of life itself. We have been burning it for well over one million years, exploiting it out of the soil for 10,000 years, combusting fossil carbon for 150 years.

Now, we can grow nano-structured fossil carbons into unprecedented materials and even human tissues. Graphene; a two-dimensional, one-atom-thick membrane in a three-dimensional world, able to sieve water from the seas, Buckminsterfullerene & Nanotubes; for Superconductivity, Solar & Thermo-electric generators.

The Stone Age did not end for a lack of stones, as well, the Combustion Age will not end for lack of fossil fuels. Nanotechnology and Terra Preta Technology has thrust The Diamond Age upon us, with it, the rectification of the Carbon Cycle, this train is leaving the station, either get on board or be left in the combusted soot and CO₂ pollution of history!

Since we have filled the air, filling the seas to full, soil is the only beneficial place left. Carbon to the Soil, the only ubiquitous and economic place to put it.

Thank you for your efforts

Just for Fun.

Ode to Dr. Seuss, "The Lorax", A Paraphrase;

"The Charist"

I am the Charist... I speak for the Carbon... I speak for the Trees for the Trees have no tongues And cannot express... what they do with their Lungs

Fix all the Carbons in Lignins and more... Which we Charistas... can Recalcitrantly Store Thermal Conversion is what biomass needs... To bring down the World-temps... a couple degrees

It can heat up our Pots... And drive us Alots... With no Ecosystem giving up what it's Gots' I am the Charist, and I'll YELL and I'll SHOUT for the fine things on earth that are on their way Out!

Externalized Cost I will shout at the most.... For Chars value in soils is easy to boast, I speak for the Humus, the Wee-Beastie Bugs...for the structure char gives them....They Just Loves'

Unless someone like you cares a whole awful lot,.... nothing is going to get better..... It's Not.....

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Technology Adviser;
Eco-technologies Group; <http://thebiocharcompany.com/>

Chairman; Markets and Business Committee
2010 US Biochar Conference, at Iowa State University
<http://www-archive.biorenew.iastate.edu/events/biochar2010/conference-agenda/agenda-overview.html>

Administrator;
Biochar Policy;
<http://tech.groups.yahoo.com/group/biochar-policy/>

All my Headline Biochar News can be reviewed at;
<http://groups.google.com/group/se-biochar>

Cited Links and References;

[1]

The Anthropogenic Greenhouse Era Began Thousands of Years Ago <http://www.springerlink.com/content/h328n0425378u736/>

The Columbian encounter led to terrestrial biospheric carbon sequestration on the order of 2 to 5 GtC Climate Forcing.

The Columbian Encounter and the Little Ice Age: Abrupt Land Use Change, Fire, and Greenhouse Forcing - Annals of the Association of American Geographers
<http://www.informaworld.com/smpp/content~db=all?content=10.1080/00045608.2010.50243>

FAO on Conservation Agricultural:

"In general, soil carbon sequestration during the first decade of adoption of best conservation agricultural practices is 1.8 tons CO₂ per hectare per year. On 5 billion hectares of agricultural land, this could represent one-third of the current annual global emission of CO₂ from the burning of fossil fuels (i.e., 27 Pg CO₂ per year)."
http://www.fao.org/ag/ca/doc/CA_SSC_Overview.pdf

Adding just 1 Ton of Biochar per hectare, (800 lbs / acre), would cover 100% Current Annual

Fossil CO2 Emissions.

"Greenhouse Gas Mitigation Potential of Agricultural Land Management in the United States: A Synthesis of the Literature"

An extensive scientific literature review providing a side-by-side comparison of the biophysical greenhouse gas (GHG) mitigation potential of more than 40 agricultural land management activities in the United States.

<http://nicholasinstitute.duke.edu/ecosystem/land/TAGGDLitRev>

NASA's EO-1 hyperspectral imagery data has been used to discern Amazonian black earth, or Terra Preta soils. The full complement of earth sensing satellites, using multiple proxy measurements of soil moisture to 3 feet depth, temperature & density, even reading GHG emissions, Dead & Alive biomass from the tree tops down at 1 hectare resolutions when the Orbital Carbon Observer 2 is aloft in 2013.

NASA's Space Archaeology; \$364K Terra Preta Program

<http://archaeologyexcavations.blogspot.com/2010/08/time-traveling-via-satellite.html>

[2]

A third generation company producing farm scale reactors for Drop-in fuels, supported by GE, Google & Conoco.

CoolPlanet Biofuels; <http://www.coolplanetbiofuels.com/>

http://www.youtube.com/watch?v=zKYZ9v_0o

[3]

SynGest; the production of fossil fuel free ammonia & char from biomass <http://www.syngest.com/>

[4]

52% reduction of NH3 loss; Work by C. Steiner, at U of GA, showing NH3 binding when char is used as a composting accelerator. This will have profound value added consequences for the commercial composting industry by reduction of their GHG emissions and the sale of compost as an organic nitrogen fertilizer.

<http://www.ibi2010.org/wp-content/uploads/BiocharPoultrySteiner.pdf>

[5]

"Biochar in OZ" a long Yahoo discussion thread with some of the practitioners and links to Australian Farm Journal articles.

<http://tech.groups.yahoo.com/group/biochar/message/13306>

Ray' O'Grady's (<http://www.smartbugs.com.au/>) very interesting work with PandA (liquid Wood smoke) for anthracnose & phytophthora root rot. Given the current controls, this sounds like a cost & environmental godsend.

Anecdotally, a poultry farmer commented at the Rodale Institute site that char from the gizzards was ground to shiny gem stones.

Iwamoto Inc, has poultry, Shrimp, Clams, eels, and gold fish on ration,

<http://superstoneclean.com/video-presentations/>

The Australian Bureau of Agricultural and Resource Economics and Sciences. Adds to the menagerie of char-fed livestock flounder, ducks & goats;
<http://envnewsbits.wordpress.com/2012/01/30/biochar-implications-for-agricultural-productivity/>

Black Carbon DK. the most forward vision for the industry. A one billion ton carbon sequestration vision, supported by the established biomass infrastructure and policy incentives in the EU. A decentralized plan for combined heat & power production with biochar products for the mandated replacement of Peat-Moss as a major market driver. A finalist for Sir Richard Branson's Virgin Earth Challenge prize. The second most cited researcher on biochar soils, Dr. Christoph Steiner, as their lead scientist has formulated an array of products for horticulture, agriculture and animal husbandry,
<http://www.blackcarbon.dk/>

Carbon Terra, <http://www.carbon-terra.eu/en/home> are offering a full line of Carbon Feeds; CarbonCattle, CarbonDog & CarbonCat foods and for a Silage mix. A full range of Fertilizers; CarbonFertilizer Field, CarbonFertilizer Garden & CarbonFertilizer Flower.

Biochar in poultry farming;

<http://www.ithaka-journal.net/pflanzenkohle-in-der-geflugelhaltung?lang=en>

[6]

The NC Farm Center has large scale field application trials encompassing 16 acres on two farms in southeastern North Carolina.

<http://www.biochar-international.org/profiles/northcarolinafarmcenter>

Virginia Tech is in their 6 th year of field trials with the Carbon Char Group's "CharGrow" formulated bagged product.

<http://www.carbonchar.com/plant-performance>

My 09 field trials with the Rodale Institute & JMU ;

<http://biochar.bioenergylists.org/node/1408>

The future of biochar - Project Rainbow Bee Eater

<http://www.sciencealert.com.au/features/20090211-20142.html>

Delinat Foundation's Mythopia Vineyard

<http://www.mythopia.ch/en/home.php>

Research on *Epigenetic* effects of Biochar;

Nikolaus has been at it 6 years. Nikolaus Foidl, "nikolaus foidl" <nikolausfoidl02@gmail.com>, <http://anthroterra.com.au/>

His work with aspirin is Amazing in Maize, 250% yield gains, 15 cobs per plant;

<http://terrapreta.bioenergylists.org/content/trials-maize-reactivating-dormant-genes-using-high-doses-salicylic-acid-and-charcoal>

[7]

Global Alliance For Clean Stoves; <http://www.cleancookstoves.org/>
Biomass Energy Foundation (BEF) website <http://biomassenergyfndn.org/bef/>
"Prof Paul Anderson" <psanders@ilstu.edu>,

Biochar Work in Nine Developing Countries:

<http://www.biochar-international.org/9country>

Pro-Natura has developed protocols and a field manual for biochar trials that are being used in ongoing trials and demonstrations in Senegal, Mali and Egypt, and has plans to extend activities to Ghana. In Latin America, Pro-Natura is poised to launch biochar production centres, farmer trials and demonstrations. In Haiti, Pro-Natura has started a project to increase vegetable production with Biochar Super Gardens integrated in agroforestry systems. This project is being implemented in partnership with the Papaye Peasant Movement and JTS Semences, with financial support from the French embassy in Haiti. Pro-Natura is also publishing a training manual – “Introduction to Biochar in Tropical Agriculture”.

http://www.pronatura.org/?page_id=521&lang=en

[8]

Biochar can even accelerate **Dr. Hansen's new plan for 100 GtC of afforestation**, through utilizing this substantial new addition to today's land-based NPP of about 60 GtC/yr and Biochar allows the soil food web to build much more recalcitrant organic carbon, (living biomass & Glomalins) in addition to the carbon in the biochar.

"The Case for Young People and Nature: A Path to a Healthy, Natural, Prosperous Future".

http://www.columbia.edu/~jeh1/mailings/2011/20110505_CaseForYoungPeople.pdf

Dr. Mario Molina, PNAS Report on Reducing abrupt climate change;

<http://www.pnas.org/content/early/2009/10/09/0902568106.full.pdf+html>



Carbon Conservation for Home, Health, Energy & Climate

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**Thanks to Bob Wells; "These are
Turnips On Biochar.....Any
Questions??"**



Craig Sam's Char-colate Cacao Trees Bearing fruit in Three years versus Five



Iwamoto Biochar for Aquaculture and Poultry



Iwamoto Biochar for Aquaculture and Poultry



Black Carbon DK.

Dr. Christoph Steiner



Black Carbon DK.

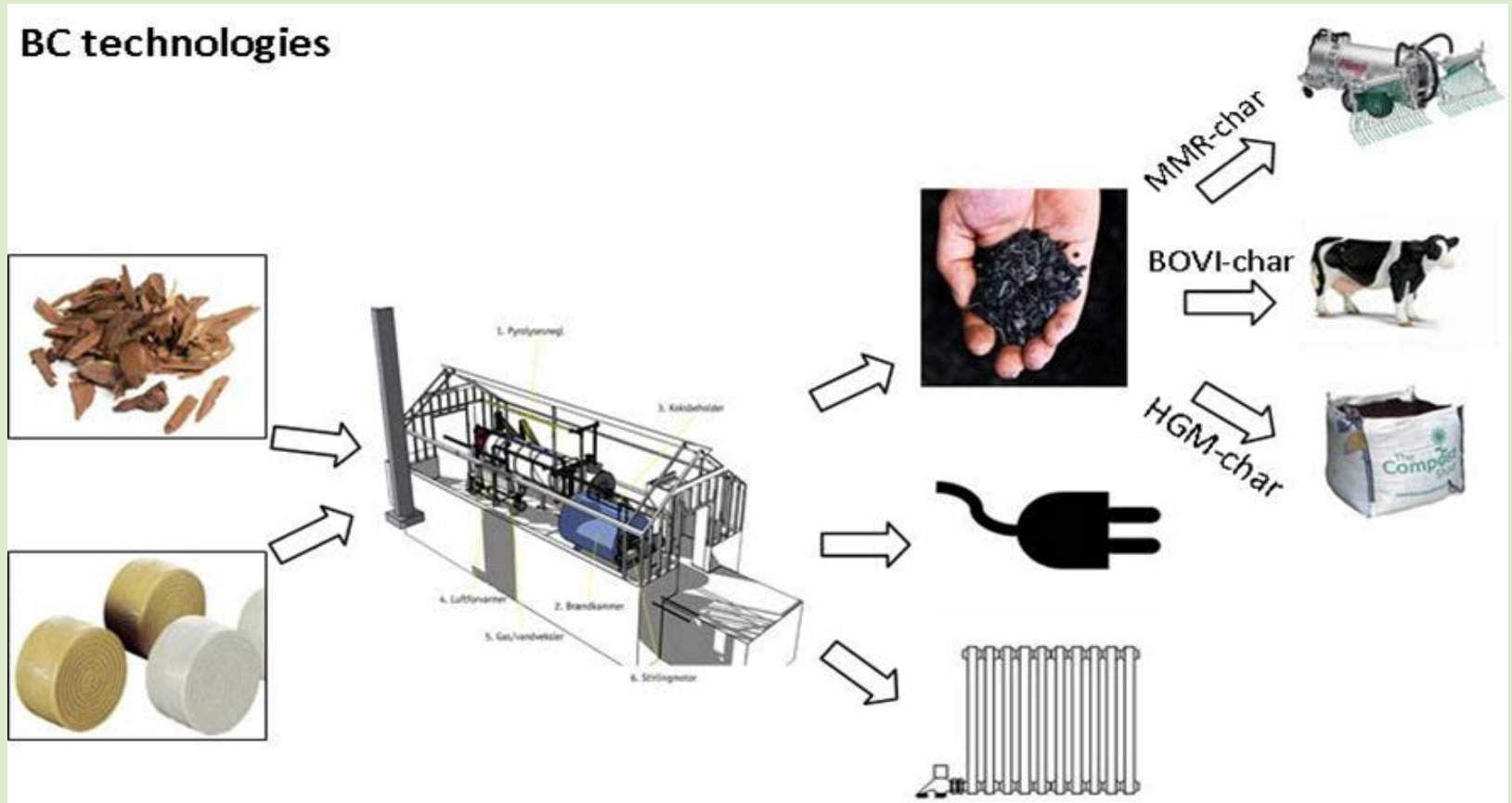
Dr. Christoph Steiner



Black Carbon DK.

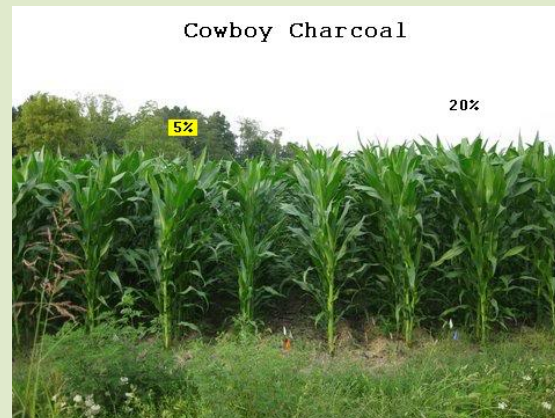
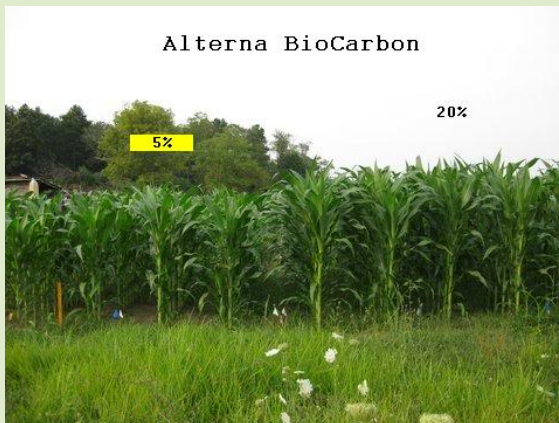
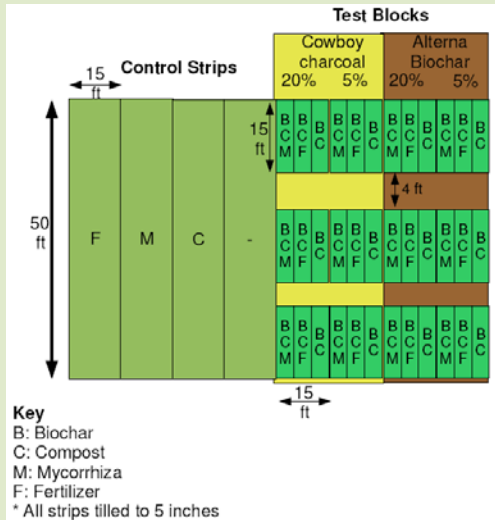
Dr. Christoph Steiner

BC technologies



2009 Virginia Field Trials

20% yield Increase

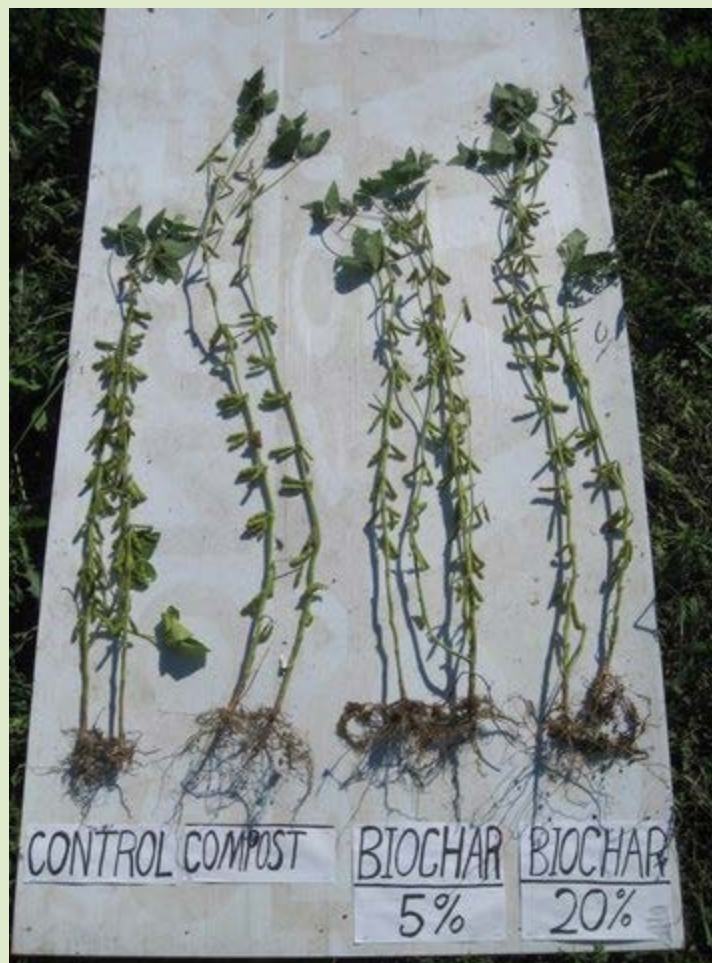


2010 Soy Yields;

Control Plots;..... 24.8 Bushels/acre

Compost Control Plots; 30.1 Bushels/acre

Biochar Plots;..... 40.8 Bushels/acre



Rizosphere Incorporated

Soil food Web Carbon Sequestration Facility.

Cut away View of a 24 / 7, Automated, solar energy integrated, recalcitrant carbon production unit.

Green Job Creation; Employment of Five million trillion trillion Wee-Beasties Carbon Storage Capacity; 150 Billions Tons of Carbon

Equal to; 550 Billion Ton CO₂
(some Northern Facilities offer winter vacations)



Biochar Cascading Values

Feed Ration for integrated nutrient management & Animal Health & Odor

from Hans-Peter Schmidt

1.

**Charging biochar with
malolactic bacteria and
add**

1 % BC to silage



2.

**1 % BC for feeding
Carbon-Feed**



3.

5 - 10 % BC in litter



4.

**1- 1,5 % BC
in liquid manure**



5.

**Composting the carbon
manure + the separated
solids of the liquid manure**

10 – 20% BC



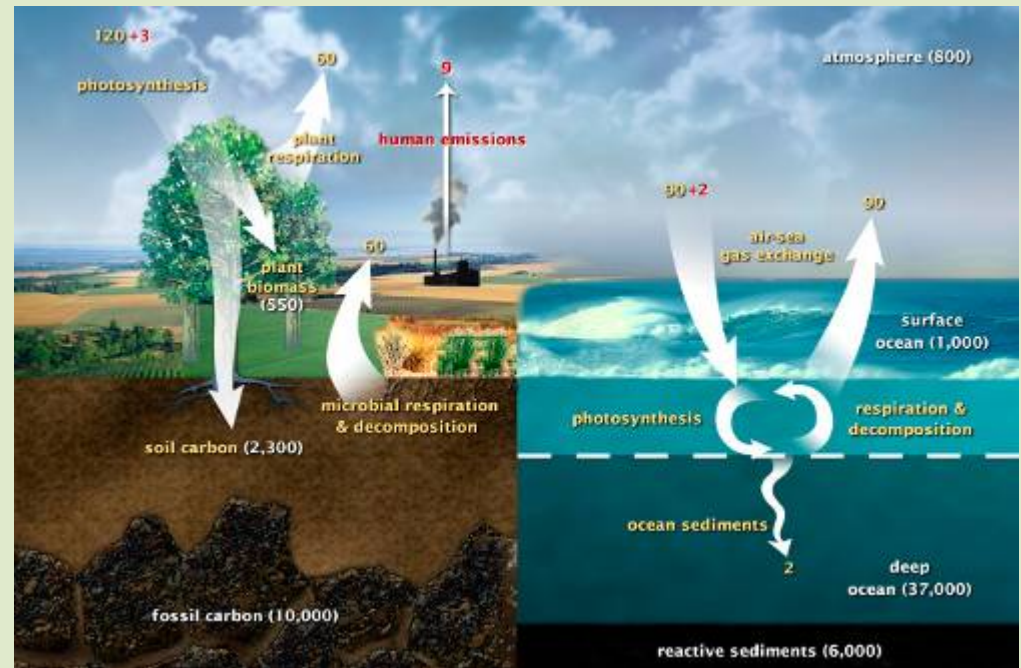
6.

Soil amendment
Fixation of nutrients
Increase of SOM



7.

Carbon sequestration CO₂-certificates?



Control

Biochar



Control

Biochar



Control

Biochar



Calabash Gourd Single Plant Over the Roof



Wee-Beastie Real estate, The Rosiest Scenario;

Total Biomass Harvest in the US; 1.6 Billion Tons

If All was processed by CoolPlanet Biofuels the Yield would be;
120 Billion Gallons of tank ready fuel , (The US uses 150 Billion
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0.3 Billion Tons of Biochar, with a Surface Area of 600 Square
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One Ton has a surfac area of 148,000 Acres! 148,000 Acres is
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