



Biochar – The Ultimate Circularity Solution in Organics

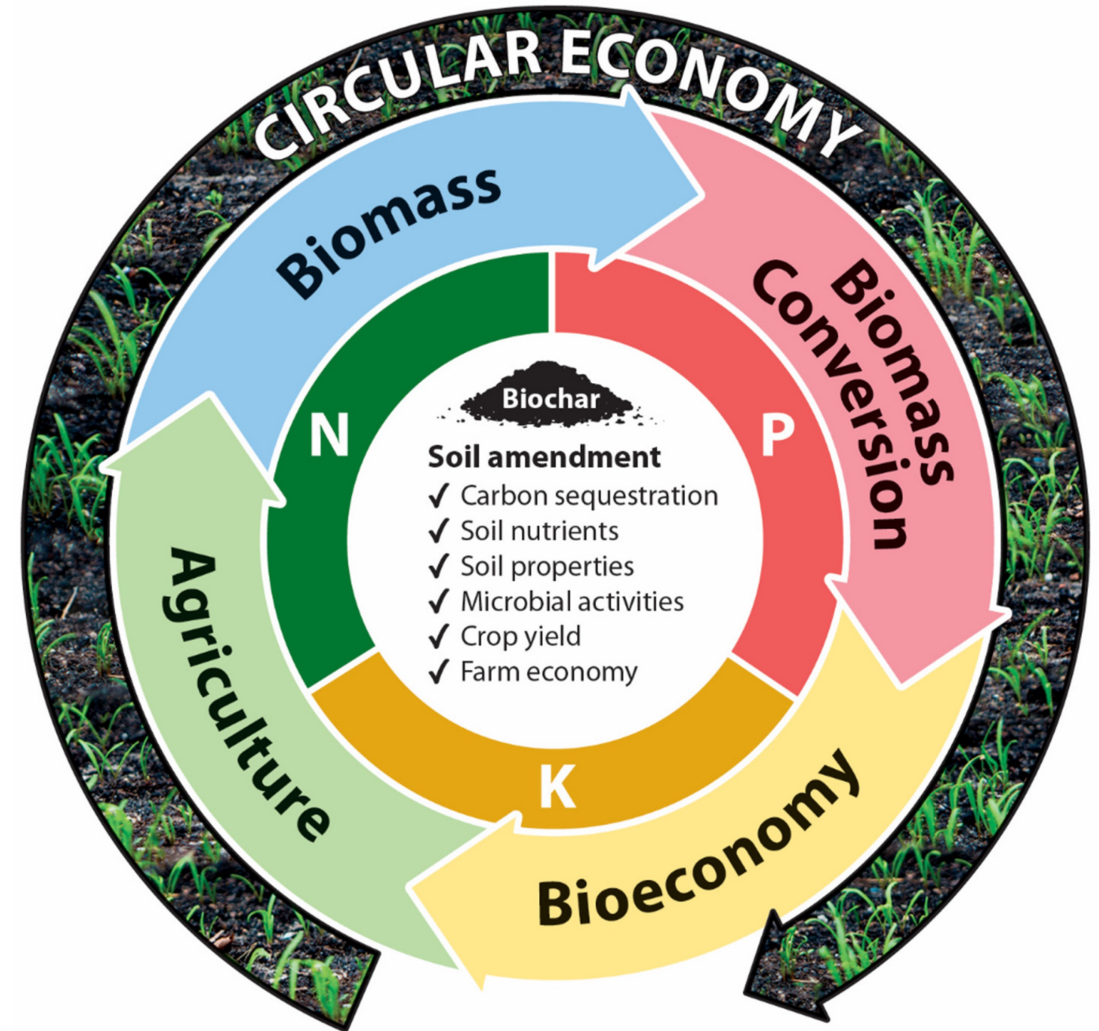


John Webster
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US Biochar Initiative
Communications

BIOCHAR.ORG
USBI



- Introduction – About USBI
- What is Biochar?
 - Characteristics & History
 - Feedstocks of Opportunity
 - Production Technologies & Thermal Conversion
 - Forms, Uses & Persistence
- Scientific Growth & Adoptions
- Biochar Markets
 - Carbon Markets
 - Biochar in Biosolids
 - Biochar in Compost
 - Biochar for Compost Odor Control
 - Biochar in Growing Media
 - Biochar as Carbon Soil Amendment
 - Biochar in Urban Landscapes
- Q&A





Fact Sheets



Online Producers Directory



Equipment & Technology Development

ABOUT USBI

Established 2009

USBI is a not-for-profit organization promoting the sustainable production and use of biochar through research, policy, technology & doing it!

Activities:

North America Conferences, Workshops, Demos, Fact Sheets, Newsletter, Website, Provider Directory, Social Media, Biochar Advocacy, Referrals, Forestry Partner, Technical Advisory Team, Research, Outreach & Education, biochar.groups.io



In-field Workshops



Trade shows & Conferences



biochar-us.org/biochar-crop-application-guidelines

US BIOCHAR INITIATIVE **BIOCHAR-US.ORG**
FILTER POLLUTANTS WITH BIOCHAR



Cleaner water at less cost

Rain and snowmelt that flow over impervious surfaces are not absorbed into the ground. Referred to as stormwater runoff, it picks up pollutants like chemicals, oils, metals and de-icers that can pollute rivers, streams, lakes, and coastal waters. Stormwater best management practices (BMPs) are used to protect these resources. Incorporating biochar into these practices can enhance their effectiveness and reduce costs.

Research shows that adding biochar to stormwater media mixes can generate these benefits:

- Increase soil water holding capacity
- Increase soil aggregation in the treatment soils improving water infiltration
- Improve soil fertility in nutrient-poor soils improving nutrient availability for plants
- Filters metals

Engineered and in situ biofilters are increasingly used in urban environments to provide green space, slow down flooding, and improve stormwater quality. These typically contain sand, soil, mulch or compost. In a meta-analysis of 84 studies, the addition of biochar was a low-cost option to remove various pollutants: heavy metals, microbial pollutants like E. coli, bacteria, and trace organics!

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In-field Workshops



Trade shows & Conferences



BIOCHAR CROP APPLICATION GUIDELINES

biochar-us.org/biochar-crop-application-guidelines

2025 North American Biochar Conference

— **MINNEAPOLIS • SEPTEMBER** —

14th – 18th

biocharconference.com

BIOCHAR GUIDELINES FOR AGRICULTURE APPLICATIONS

Practical insights for applying biochar to annual and perennial crops



US Biochar Initiative

biochar-us.org

BIOCHAR INCREASES PLANT SURVIVAL



Use less water.
Increase yields.

BIOCHAR IMPROVES MANURE MANAGEMENT



Good for
the animals.
Good for the
environment.

Learning Center



Find on the Learning Center: biochar.org



Find on biochar.org
Education tab
Slides & Presentations

What is Biochar?



C-rich material made by carbonizing biomass using little or no oxygen

Solid carbon material (60% - 90%)
Produced from organic matter
Resistant to decomposition
Unlike charcoal, not used for energy



Ancient Technology, Rediscovered – Terra Preta “Dark Earth” of the Amazon



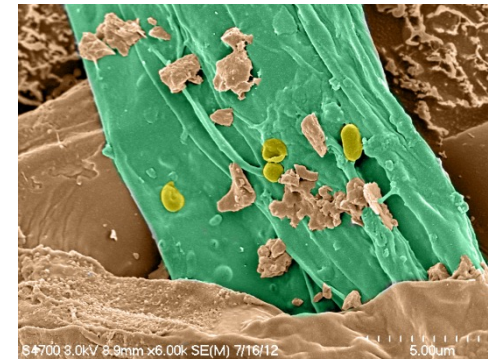
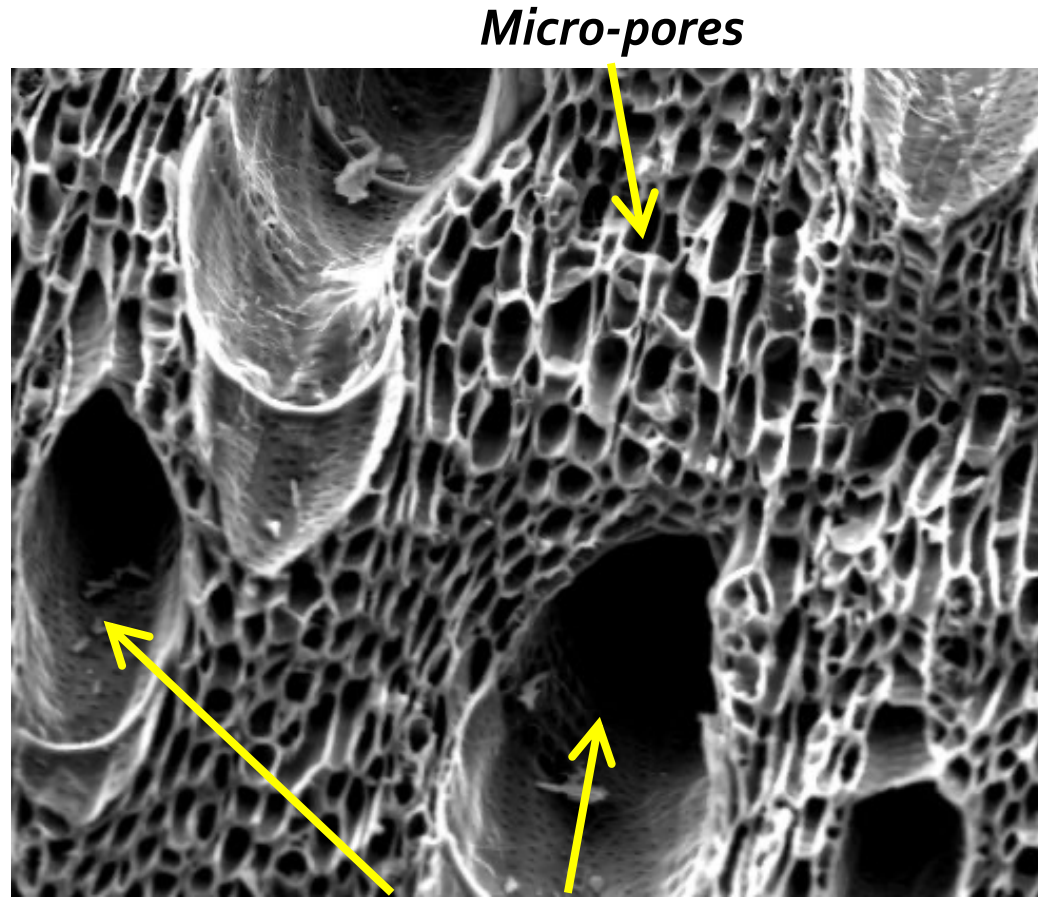
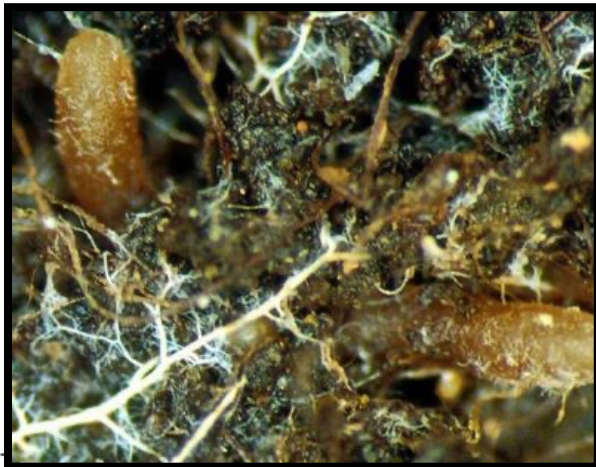
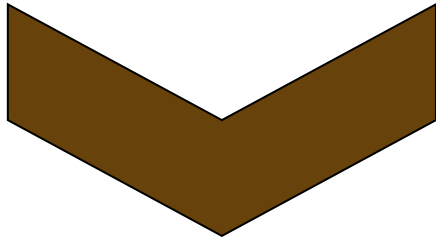
Carbon-Negative Process CO₂:C ratio = 2:1-3:1



Biochar is configurable to address many uses



What is Biochar?



Macro-pores

1 Cubic Foot = ~600 acres of surface area
1 Yard = ~16,000 Acres of surface area (AKA - Microbial Real Estate)

- Iowa soils – some of the most fertile in the world
- Why? Natural biochar formed by prairie fires
- Root zone excludes oxygen, producing char, not ash
- Primarily lost from Industrial Agriculture, Dust Bowl and Fire Suppression

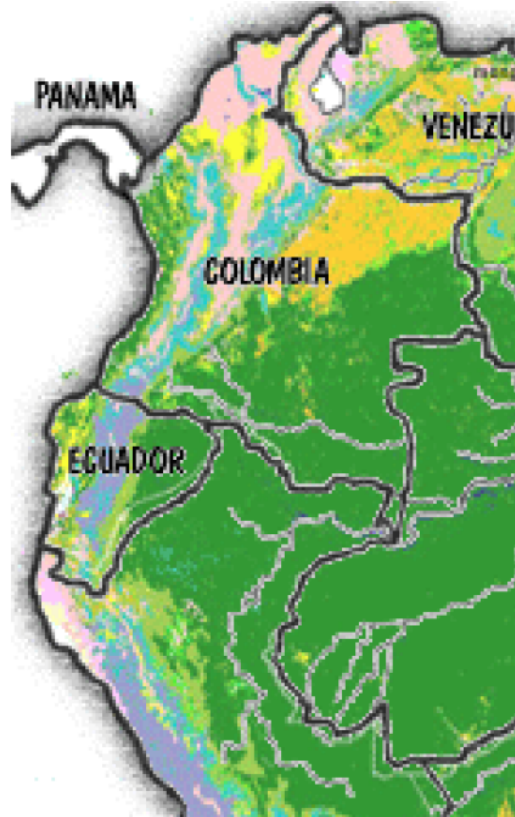


An Old Technology, Re-Discovered

- Terra Preta ("Dark Earth")
- Dates back more than 2500 years
- 1st documented in Amazon by James Orton (1870)
- 1st researcher of Terra Preta soils by Wim Sombroek (1966)
- International Awareness 2001-2002 led by Johannes Lehmann, Cornell
- Still actively being created in small clusters throughout Southeast Asia and Africa

BLACK GOLD OF THE AMAZON

Fertile, charred soil created by pre-Columbian peoples sustained surprisingly large settlements in the rain forest. Secrets of that ancient "dark earth" could help solve the Amazon's ecological problems today.

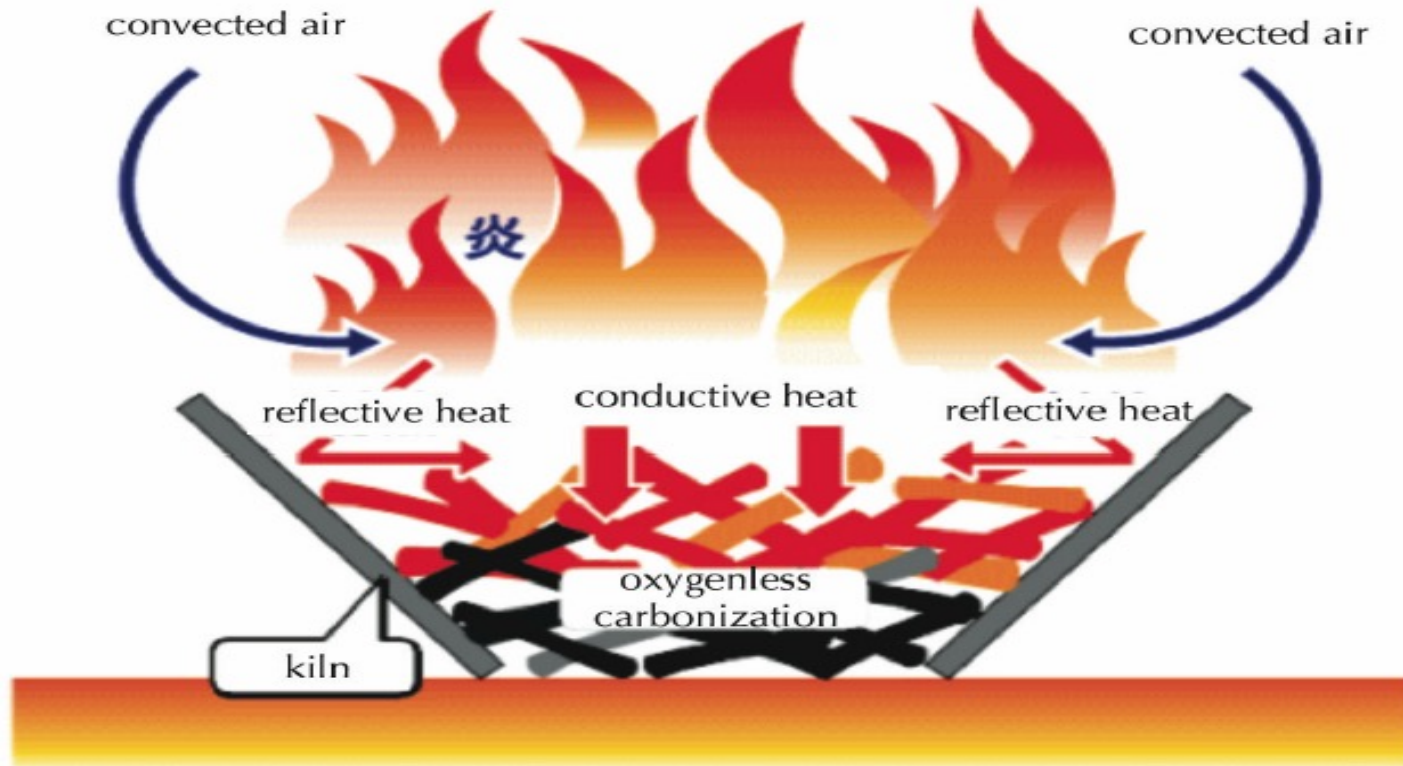


Pyrolysis – The basics.

Hello Pyrolysis!

(HIGH HEAT & ABSENCE OF OXYGEN)

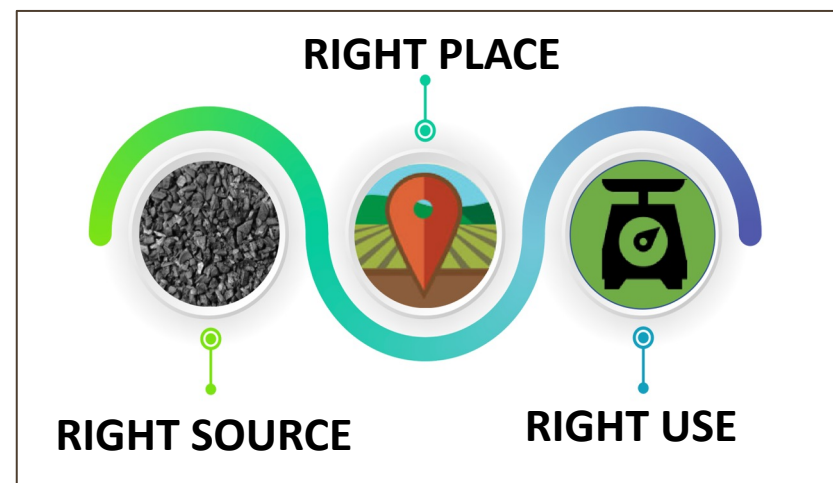
- Exposing organics to high heat in the absence of oxygen.
- Ancient techniques included pit burning and top-down burn.
- Modern mechanical systems contain the process and reduce emissions of heat, gases, and smoke.



Flame Cap Kilns Make Char by Limiting Oxygen at Base of Fire.

Biochar Offers Unique Forms & Uses

PROPERTIES VARY - KNOW YOUR NEEDS



Be sure your Biochar(s) are certified or supplier proof of lab analysis that meets IBI Biochar Standards Version 2.1 ([Link](#))



STAY CURRENT
Raw Biochar

Pelletized Biochar

Granular Biochar

Blended Biochar

Liquid Biochar

Soil carbon comes in many forms, and each play an important role



Labile (Living)

- Compost and manure
- Nutrient rich
- Highly degradable
- Short-lived



Humic (Dead)

- Humus
- Humic / fulvic acids
- Complex organic compounds
- Degradable



Recalcitrant (Very Dead)

- Mostly pyrogenic
- Structural
- Fixed Carbon
- Long-lasting (100+ years)

These three types of carbon can complement each other

- **Biochar** - is a solid material obtained from thermochemical conversion of biomass in an oxygen-limited environment (pyrolysis) containing at least 60% carbon. Feedstocks may be composed of crop residue, wood or other forest waste, and animal manures. Materials transported in salt water, painted, or treated with preservatives are not permitted. When listing biochar in an ingredient statement, the feedstock shall be designated by prefixing the term biochar with the feedstock from which it was produced; i.e. poultry litter biochar, green waste biochar, papermill biochar, etc. When more than one feedstock is involved, all feedstocks greater than 10% of the total volume are to be listed by decreasing volume. Their uses include soil amendments.

State regulating the sales and distribution of soil amendments includes:

Arkansas	Illinois	Mississippi	Ohio (ag use only)	Utah
California	Iowa	Montana	Oregon	West Virginia
Colorado	Kansas	Nebraska	Pennsylvania	Wisconsin
Connecticut	Maine	New Jersey	Rhode Island	Wyoming
Delaware	Maryland	New Mexico	South Carolina	
Florida	Massachusetts	North Carolina	South Dakota	
Georgia	Michigan	North Dakota	Tennessee	
Idaho	Minnesota	Oklahoma	Virginia	

Biochar in Compost – Working Together

- Both methods “*close the loop*” to recycle organic wastes
- “As an entrepreneur, anytime I can take a problem and turn it into an opportunity, that’s a win for me!”



- Pairing composting facilities with pyrolysis technology can provide economic advantages
- Not in competition for feedstocks, and can be combined for synergistic benefits
- Ideal compost materials: 60 – 70% moisture, high nutrient levels, and low lignin content.

- Ideal biochar feedstocks: 10 – 20% moisture & high lignin content
 - Biochar contains upwards of 70 - 90% stable C, while compost contains between 2 -14% stable C but greater nutrient availability



Photo: Utah Soil Health Program

Biochar in Compost - Improve Compost, Save Money



Biochar (5%-20%) can enhance the composting process:

- Reduces Odor & Ammonia Loss
- Increases Nitrogen Retention
- Accelerates the Composting Process by 20%
- Greatly Enhances the Beneficial Biological Populations in Compost

Poultry Litter Compost + Biochar

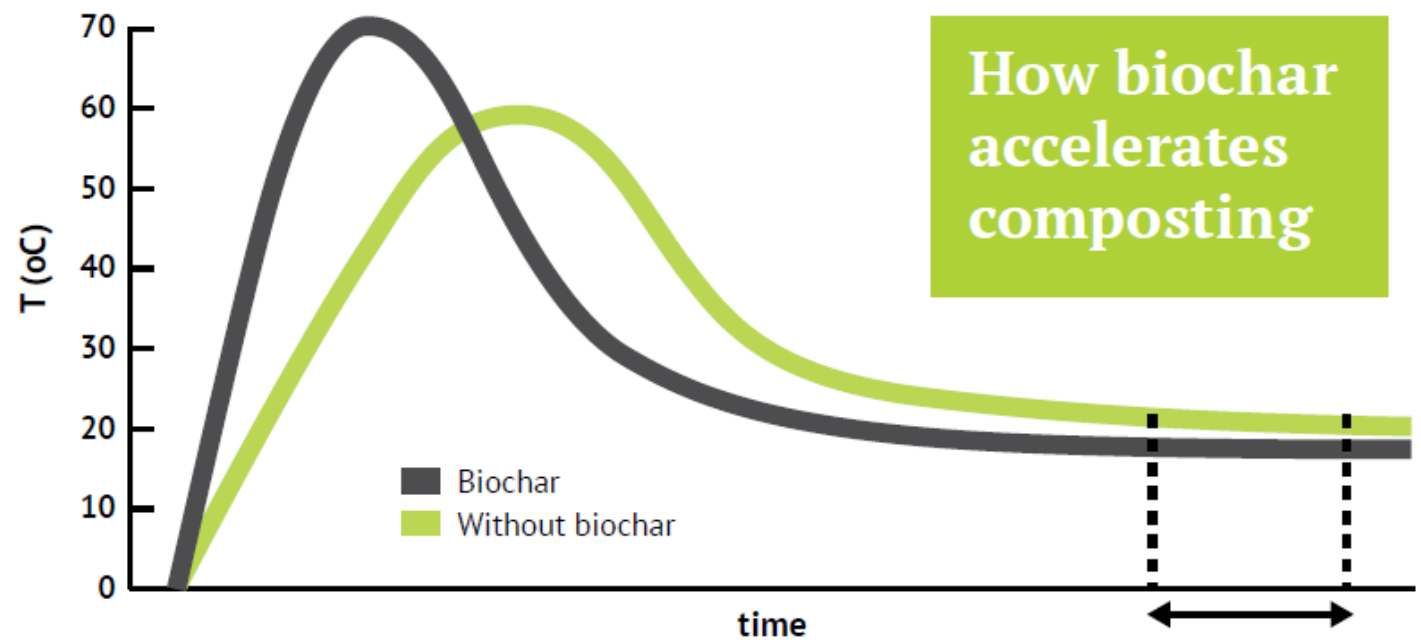
Acts as a slow-release fertilizer and limits loss or reactive nitrogen to the environment compared to raw manure and synthetic fertilizers
Co-composting with biochar decreased losses of TN by 51% & NH₃ by 60% resulting in higher nitrogen retention



Biochar in Compost - Improve Compost, Save Money

Increased Production & Savings

- Reduced time to maturity
- Less frequent pile turning
- Fuel and labor savings



Biochar increases the temperature in the compost process, accelerating material decomposition



Biochar in Compost - Odor Control

Biochar Use in Odor Removal Systems:

- Applications include compost additive and biocover
- Significant (>90%) reduction in ammonia (NH_3), hydrogen sulfide (H_2S) and other malodorous emissions with increased biochar (~20% volume)

Biochar as Compost Additive:

- Significant reduction in NH_3 and Volatile Sulfur Compounds (VSC) emissions when mixed with compost.
- Improves the degradation of volatile fatty acids and microbial abundance.
- Effect of biochar on temperature and moisture content.
- Enhances microbial activity and quality of end products.

Biochar in Biocover Applications:

- Reduces emissions from liquid and solid waste, particularly in animal manures.
- Effective in reducing the concentration of NH_3 and H_2S .



(Steiner et.al., Duann et.al., Awasthi, et.al.)

Biochar in Compost – Recycling Study

CO-COMPOSTING BIOCHAR AT NAPA RECYCLING IN AN UPFLOW COVERED AERATED STATIC PILE (CASP) ENGINEERED COMPOSTING SYSTEM (ECS)

Key findings:

1. Biochar co-composting reduced non-methane VOC emissions, a feature of biochar that can be used to increase compost facility throughput under permitted VOC emission levels.

On average, adding 10% by volume biochar from forestry residuals to the green and food waste feedstock reduced VOC emissions by 33% across composting cycle.

2. Biochar reduced the curing time required to achieve compost maturity. Biochar treatment reached low levels of free ammonium in the compost one week sooner than the Control.

3. Adding Biochar increased the NPK value of the finished compost. The NPK value of the finished compost increased by 11% in this test relative to the Control. The biochar imparted a time-release property to some of the nutrients in the finished compost.

4. Biochar treatment reduced the salinity of the finished compost. The concentration of calcium and magnesium salts in the finished compost decreased by over fifty percent in the soluble extract.

Biochar in Growing Media

Biochar offers alternative ingredients in growing media and potting additives such as Sphagnum peat, vermiculite, perlite, and lime.



Traditional Media Challenges:

- Growing media costs
- Supply chain issues
- Ingredients environmental impacts

Biochar replacement/enhancement for growing media includes:

- Bulking agent; medium size (2mm-6mm)
- Hydrophilic: ability to retain moisture (~25%)
- Low in nutrients like NPK
- Nutrient holding due to high CEC
(Reduced leaching = reduced fertilizer requirements)
- Enhanced microbial activity



Biochar in Growing Media

Biochar specifications vary by use, media and crop requirements. Consult local biochar broker or producer before buying or applying.

Active Composting To increase production efficiency, increase nutrients & biology	Compost for Biochar Conditioning To condition or prime the char for land applications	Value Added Compost To make a higher value soil amendment
<p>10-15% Biochar added at the earliest stages of composting</p> <p>85-90% feedstocks</p> <p>CAUTION: biochar holds much more water than your other feed stocks</p>	<p>10% Compost 90% Biochar</p> <p>IF it's a dry biochar then add in water to get it moistened (preferably in a compost tea). Cure for 6-8 weeks</p>	<p>50% Compost 50% Biochar</p> <p>Added after you have achieved PFRP and the compost is in it's "curing phase". Ready in a few days to 1 week.</p> <p>Process to Further Reduce Pathogens (PFRP)</p>

Biochar as Soil Carbon Amendment



Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

CONSERVATION BASICS

GETTING ASSISTANCE

PROGRAMS & INITIATIVES

RESOURCES

NEWS & EVENTS

CONTACT



Financial and Technical Assistance for Biochar Application

Soil Carbon Amendment: Conservation Practice Standard 336

Offsets the financial cost of biochar, compost, or biochar:compost mixtures

Changes the value proposition of biochar
from yield to conservation

US BIOCHAR INITIATIVE **BIOCHAR-US.ORG**
NRCS BIOCHAR FUNDING
QUICK GUIDE FOR US PRODUCERS

Photo: Josiah Hunt

NRCS BIOCHAR FUNDING FOR US PRODUCERS – A QUICK GUIDE
The newly developed Conservation Practice Standard Soil Carbon Amendment (336) can be used by growers to offset the costs of applying biochar to improve soil health and build soil carbon. This FAQ identifies practical information on what the practice standard is, how it works, and important details to consider when applying for the funding.

Biochar as Soil Carbon Amendment

NRCS Code 336 – Soil Carbon (Biochar) Amendment - biochar-us.org/code336



USDA United States Department of Agriculture 336-CPS-1

Notice of Proposed Changes to the National Handbook of Conservation Practices for the Natural Resources Conservation Service
[Docket No. NRCS-2021-0005]
PROPOSED FULL TEXT FOR PRACTICE STANDARD CODE 336

Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
SOIL CARBON AMENDMENT
CODE 336
(ac)

DEFINITION
Application of carbon-based amendments derived from plant residues or treated animal byproducts

PURPOSE
Use this practice to accomplish one or more of the following purposes:

- Improve or maintain soil organic matter
- Sequester carbon and enhance soil carbon (C) stocks
- Improve soil aggregate stability
- Improve habitat for soil organisms

CONDITIONS WHERE PRACTICE APPLIES
This practice applies to all land uses where organic carbon amendment applications will improve soil conditions, with the following exceptions:

- Do not use this practice to apply amendments where changes to the plant community could be undesirable or unknown (e.g., changing a native or an established desired community etc.).
- Do not apply amendments when nutrients in the amendment will not be directly used (e.g., nutrient-rich amendment applications to fallow land or fields without existing or planned vegetative cover).
- To apply raw manure, biosolids, or other amendments that may have environmental impact(s), use NRCS Conservation Practice Standard (CPS) Nutrient Management (Code 590).

CRITERIA
General Criteria Applicable to All Purposes
Plan, design, and implement carbon amendment applications in compliance with all federal, state, and local laws and regulations. The owner or operator is responsible for securing all required permits or approvals and for applying in amendment in accordance with such laws and regulations.

Evaluate site using appropriate planning criteria, assessment tools, or evaluation activities for the intended land use to determine where soil carbon amendments will achieve the intended purpose(s).

Test the soil prior to amendment application. Use laboratories meeting current requirements and performance standards of the North American Proficiency Testing Program under the auspices of the Soil Science Society of America or use an alternative State-approved certification program that considers laboratory performance and proficiency to ensure accuracy of soil test results.

NRCS, NHCP April 2022

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.
USDA is an equal opportunity provider, employer, and lender.

USBI NRCS Code 336 Day 2 Session 1 w K...

DAY 2 – USDA NRCS

USDA NRCS Code 336 & 808 Soil Carbon Amendment

January 18 & 19, 2023

USDA United States Department of Agriculture Natural Resources Conservation Service

USDA NRCS Code 336 808 Day 1 Session 1 of 5 -...

USDA NRCS Code 336 808 Day 1 Session 2 of 5 - Ilana...

Purpose: Supports the application of biochar, compost, and other state-approved carbon amendments (for example, harvested aquatic plant biomass, bagasse, distillation residue) to increase soil carbon sequestration and improve soil health on all land uses. The evaluation and monitoring of soil properties, amendment characterization, and short and long-term conservation objectives form the basis for the soil carbon amendment practice plan.

Definition: Using amendments derived from plant or animal residues to improve the physical, chemical, and biological properties of the soil.

Adoption Status: Nationwide

Excluded: No Biosolids, Sewage Sludge, or Raw Animal Manure.

Allowed: Biochar Imported, Compost + Biochar Imported

Requirements: Requires nutrient management plan

Payments: Paid for biochar by cy, delivery and installation

Funding: Managed by each adopting State. Major funding available

Federal Register: <https://www.nrcs.usda.gov/sites/default/files/2022-11/336-NHCP-CPS-Soil-Carbon-Amendment-2022.pdf>

Biochar as Soil Carbon Amendment



Biochar – Supply Chain Opportunities

Biochars are Delivered in Bulk

80 CY 8-10 t



2 CY 400 lb dry



- High carbon
- Low Volatiles
- Low Ash
- Low Fines
- Good Flowability

Oregon Biochar Solutions
www.chardirect.com

Biochar in Urban Landscapes



PARKS



TREE PLANTING



GREEN ROOFS



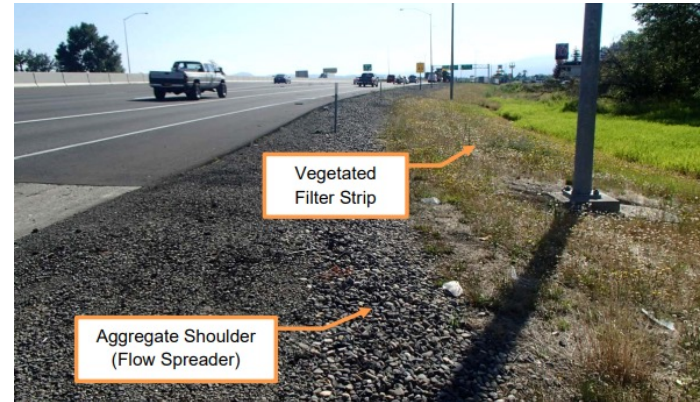
TURF MANAGEMENT



MUNICIPAL SOILS



Biochar in Stormwater Management



Biochar in Built Environment

Examples of typical installations – Rural / Urban and Airport Installations



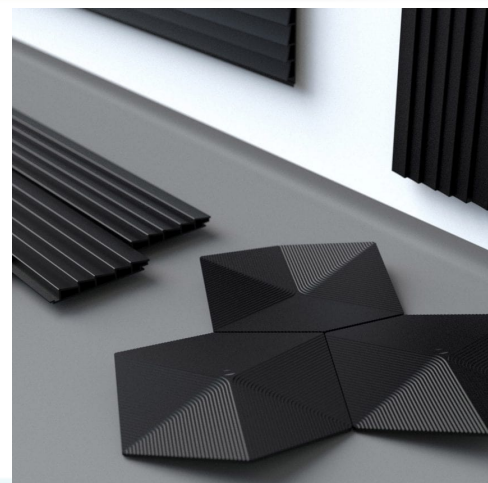
Biochar in Built Environment



Drywall



Tile



Plastics & Printer Filament



Biochar Feedstock Opportunities



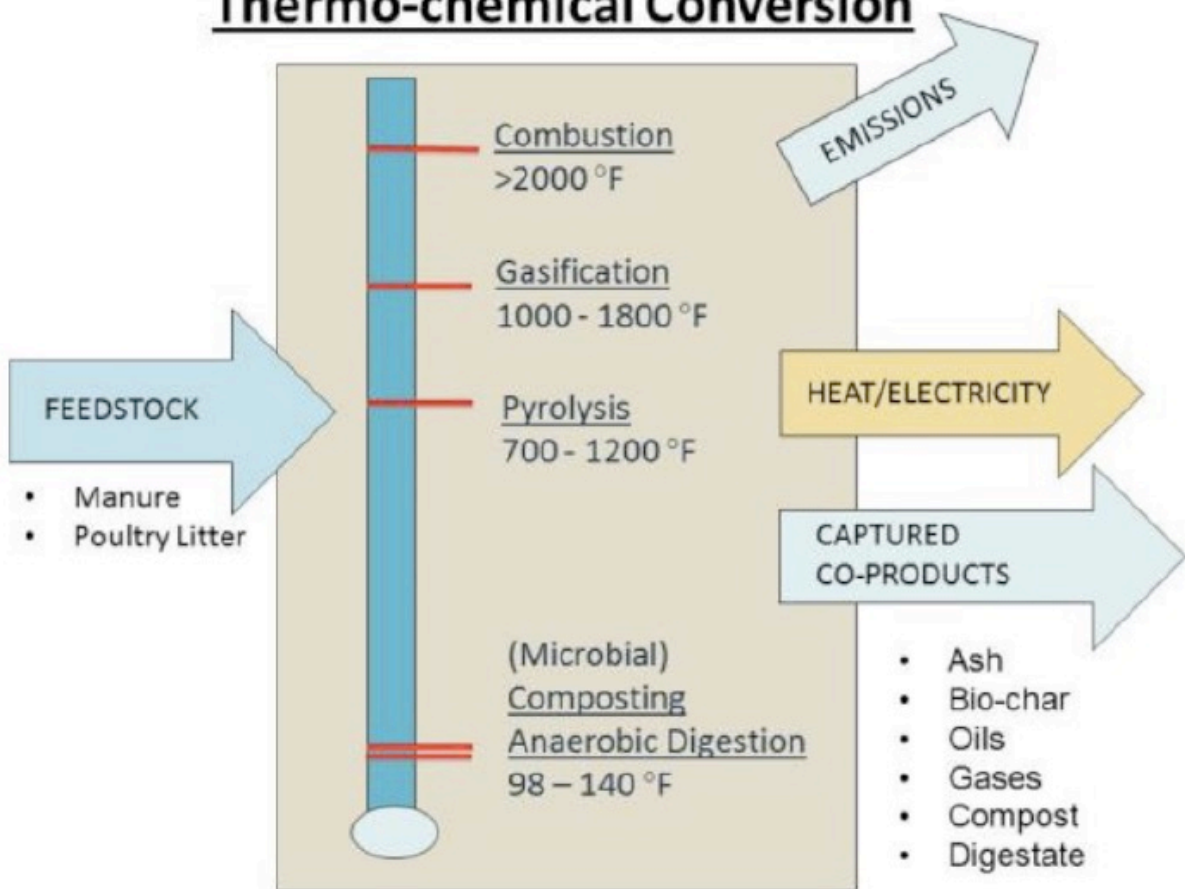
**All Biomass can become Biochar,
doesn't mean it should.**

- Biochar Production versus Biochar Offtakes/Bulk Buying
- Assess the local/regional markets, Biochar Quality and how it will be used – **"Fit-to-Purpose"**
- Wide array of biochars. Work with biochar broker & carbon market experts
- Carbon Credits are Booming but...

- US Farm Bill
- Conservation Programs – Code 336
- Bipartisan Biochar Research Network Act 2023
- Inflation Reduction Act
- Friendly State-level Policy & Incentives
- Bioenergy & Biochar (BeCCS)
- Carbon Markets
- Industrial Decarbonization Programs
- 45Q The Carbon Capture Tax Credit
- Biochar in the Infrastructure Bill
- USFS Wood Innovations Program

Thermochemical Conversion & CHAB

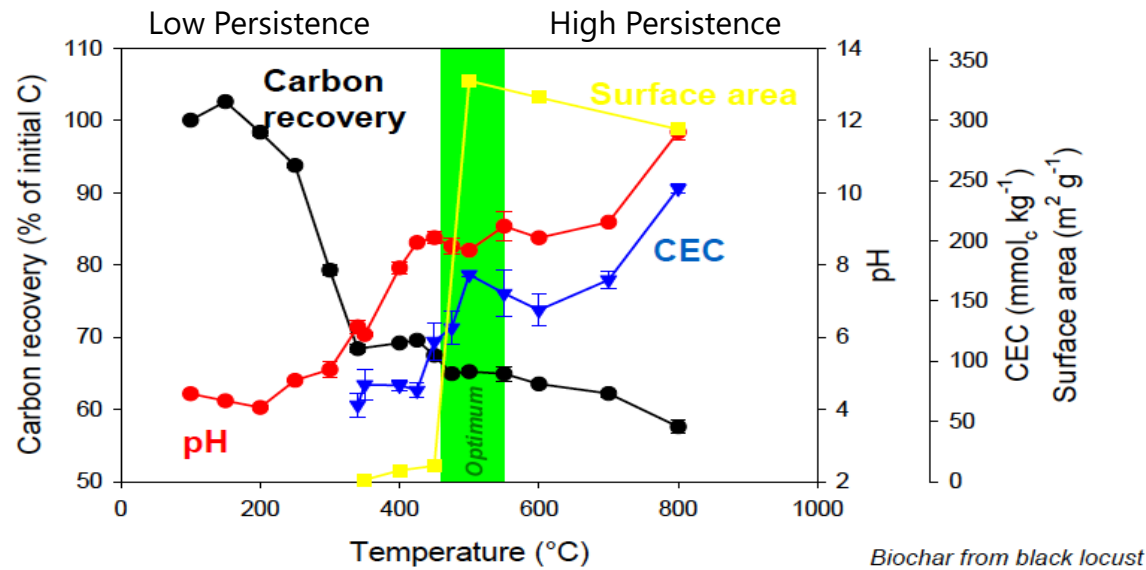
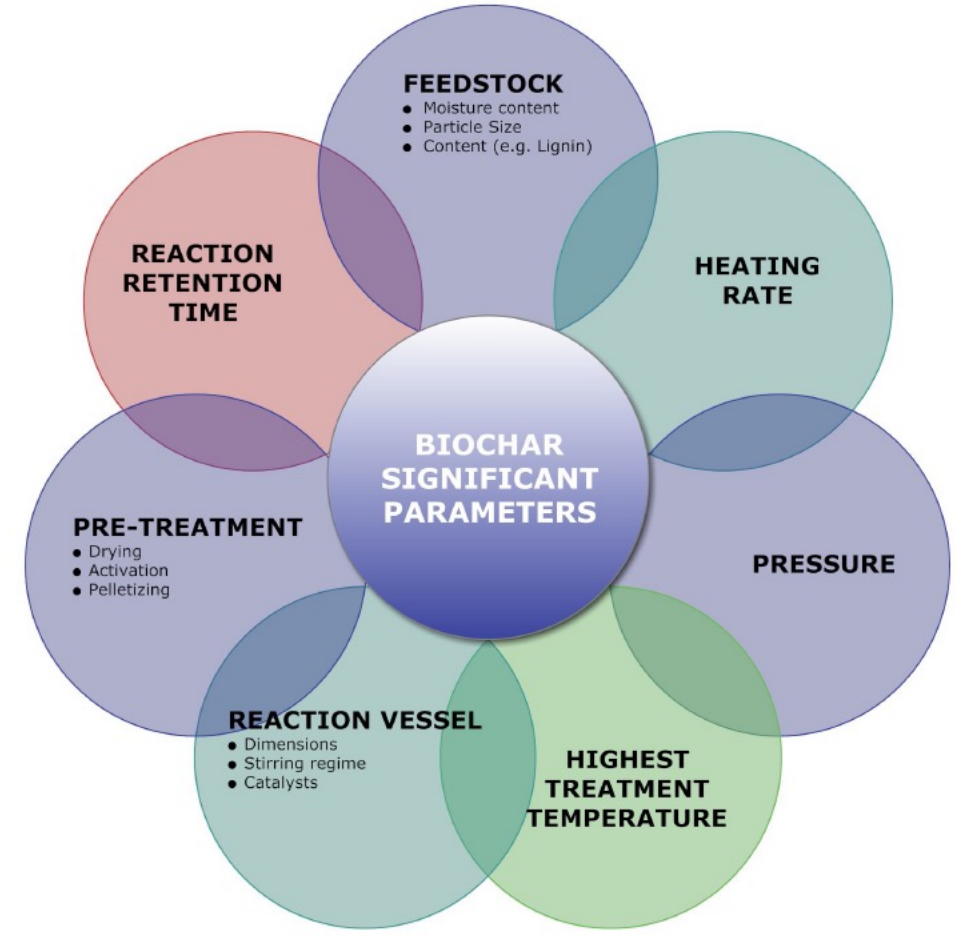
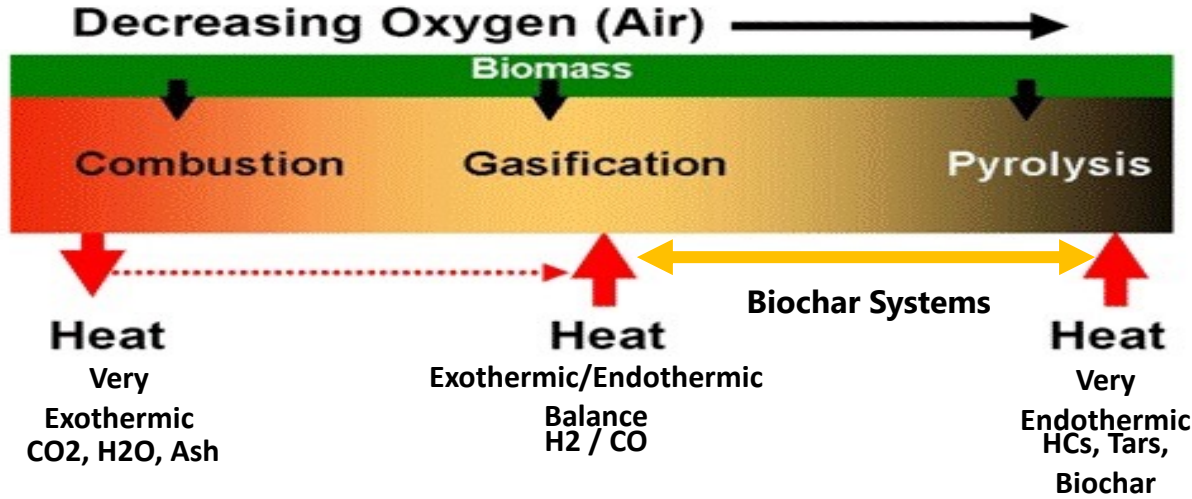
Thermo-chemical Conversion



INFLATION REDUCTION ACT - TAX INCENTIVES!!

Thermochemical Conversion

THERE IS NO 'BURNING' OR 'INCINERATION' IN THE PROCESS



1. Graphic C. Hegberg as modified
2. Lehmann, 2007
3. Graphic C. Hegberg as modified

Biochar - Mobile, Modular, and Industrial Systems



Ring of Fire - Wilsonbiochar.com



Big Box Biochar – Utah State University Forestry



AirBurners CharBoss - airburners.com

Mobile systems range from \$1,500 to \$750,000



Pyreg 500 - Pyreg.de



ARTi Char - artichar.com



Earthcare, LLC - Earthcarellc.com



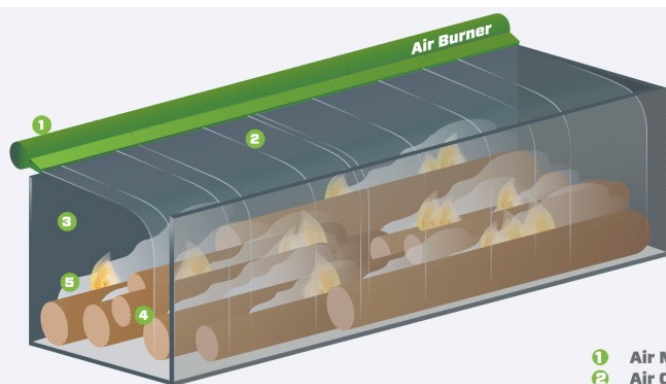
Oregon Biochar Solutions
Chardirect.com

Commercial fixed systems range from \$250,000 to many millions

Mobile Mechanical Biochar Production



HOT NEWS!!!
Title V Permitting Reformed!
Effective 4/17/24 ACI systems
no longer require Title V permits.



- 1 Air Manifold
- 2 Air Curtain (left to right)
- 3 Firebox Refractory Wall
- 4 Wood Waste or Wood Fuel
- 5 Smoke (PM or Black Carbon)

Mobile Biochar Production Systems



Container Biochar Production Systems



ARTi



**Arizona Log
Southwest
Biochar**

**Replacing expensive fuels
for drying operations with
on-site extra biomass.**



Earthcare, LLC Organics Processing Facility, Bethel PA

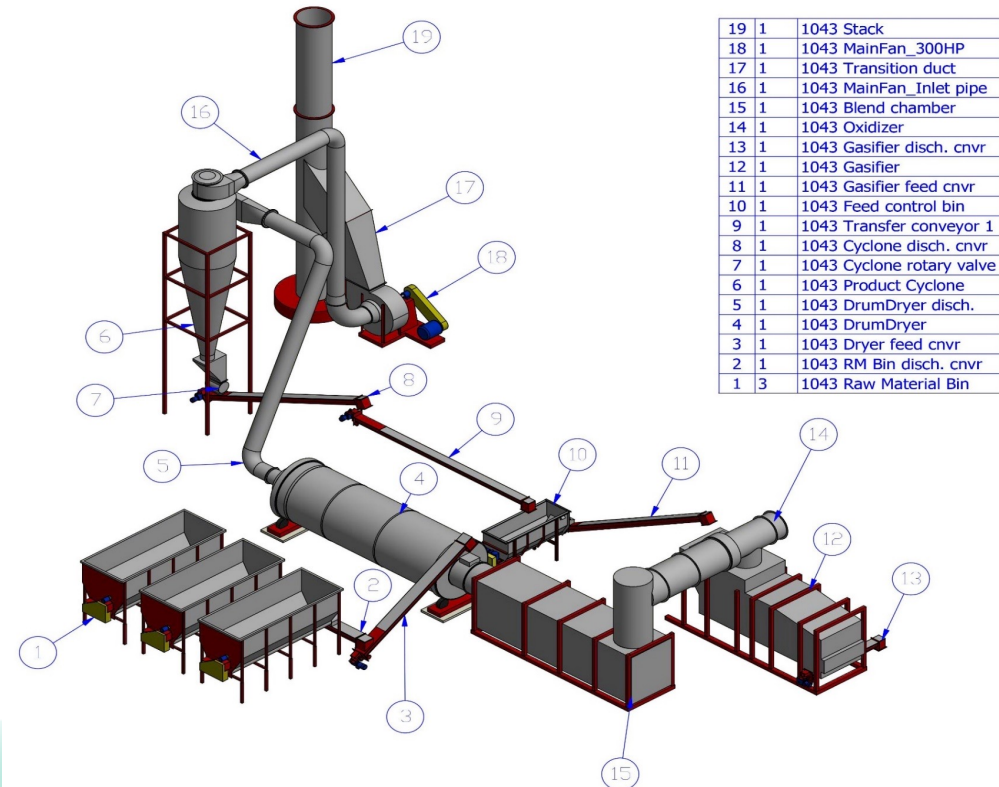
Location: Bethel Twp., Berks Co., PA

Capacity: Up to 100,000 TPY of mixed organics

Feedstocks: 60,000 TPY of biosolids (under contract), remaining chicken manure, spent hens, dewatered dairy manure, saw dust, etc

Products: 7,000 TPY of biochar, hot air for feedstock drying, condensed/recycled water for biochar quench

Financing: state processed bond to private investors



Earthcare, LLC Organics Processing Facility, Bethel PA

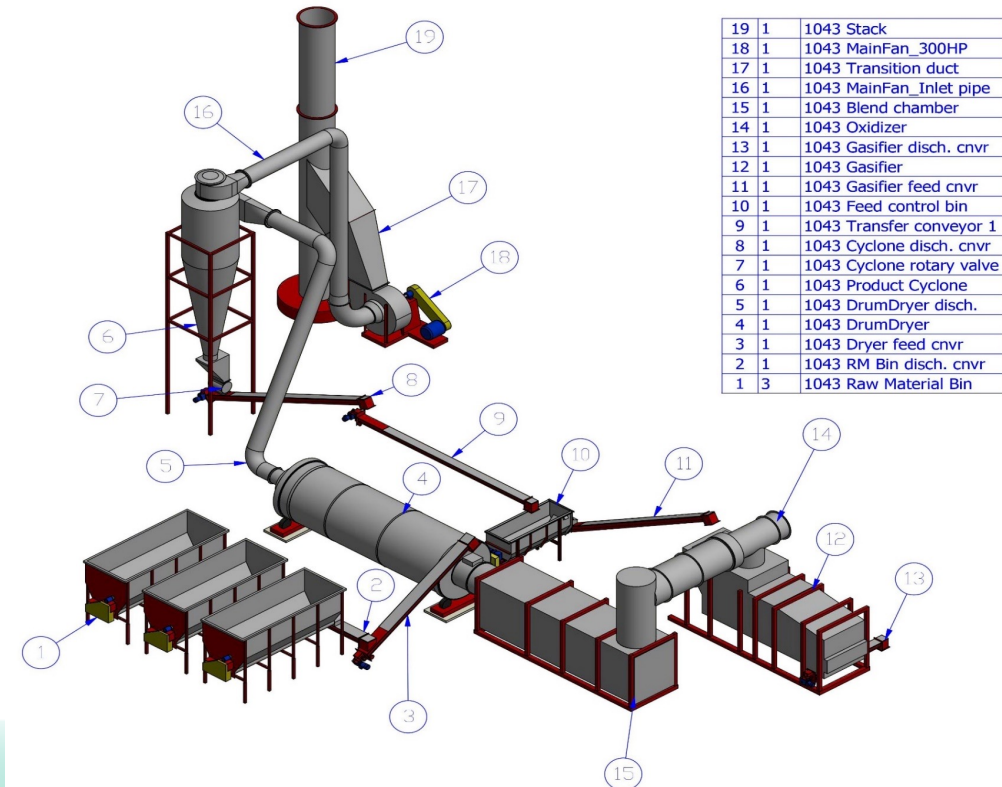
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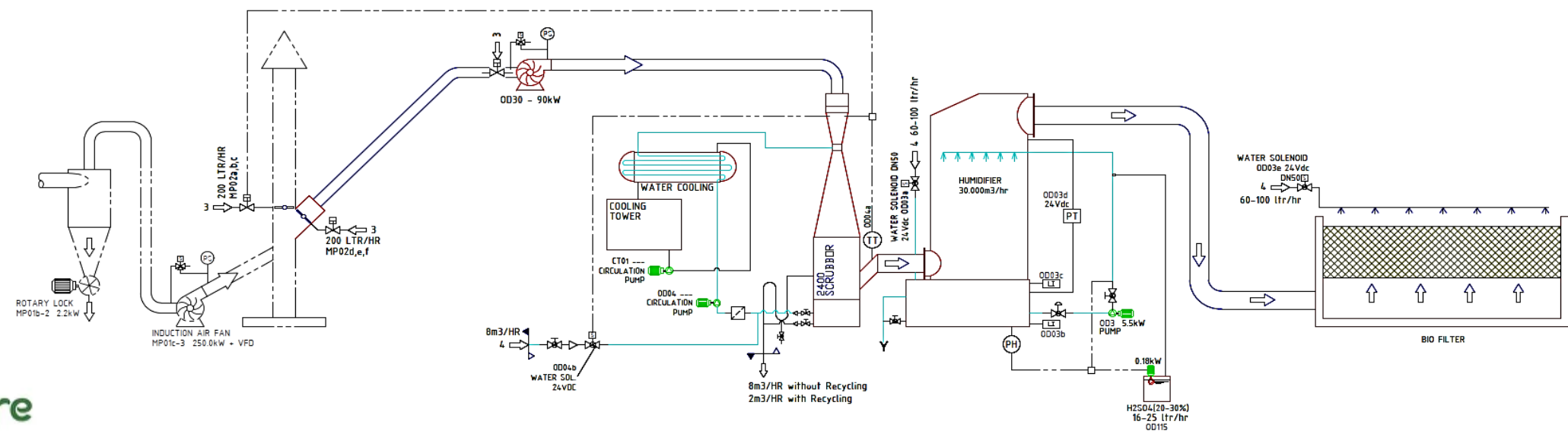
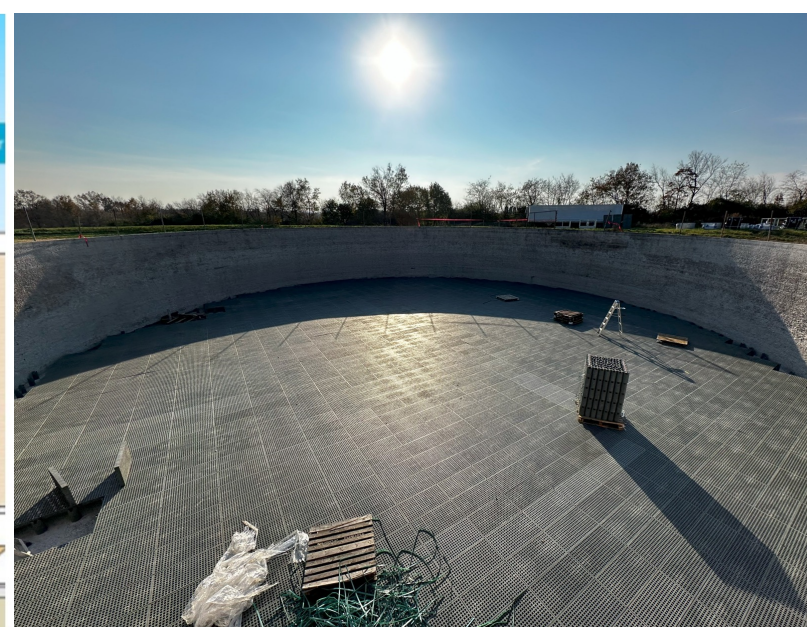
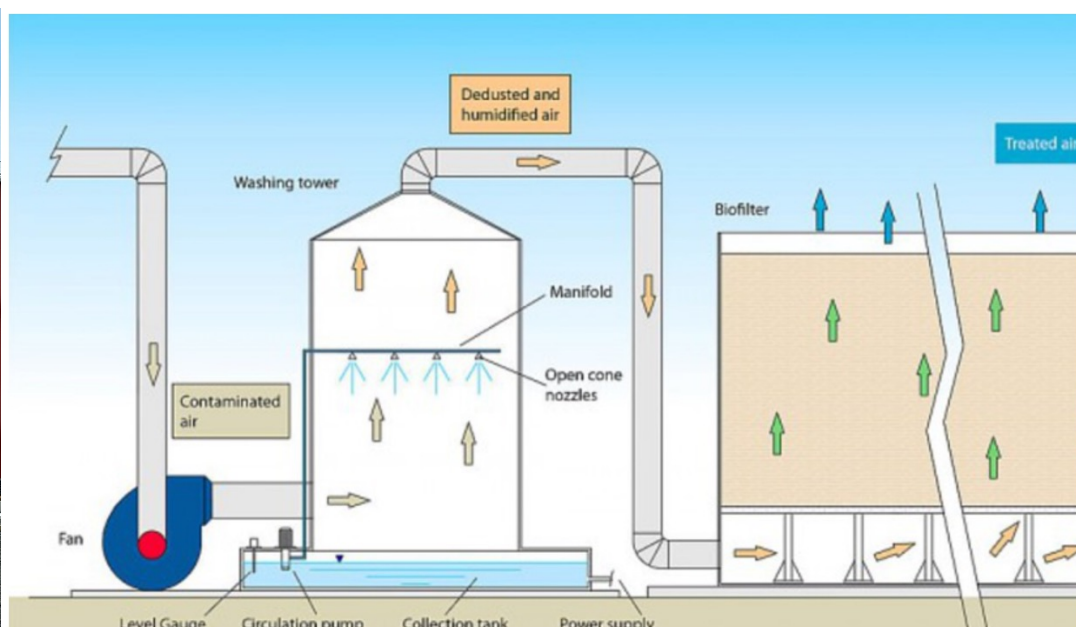
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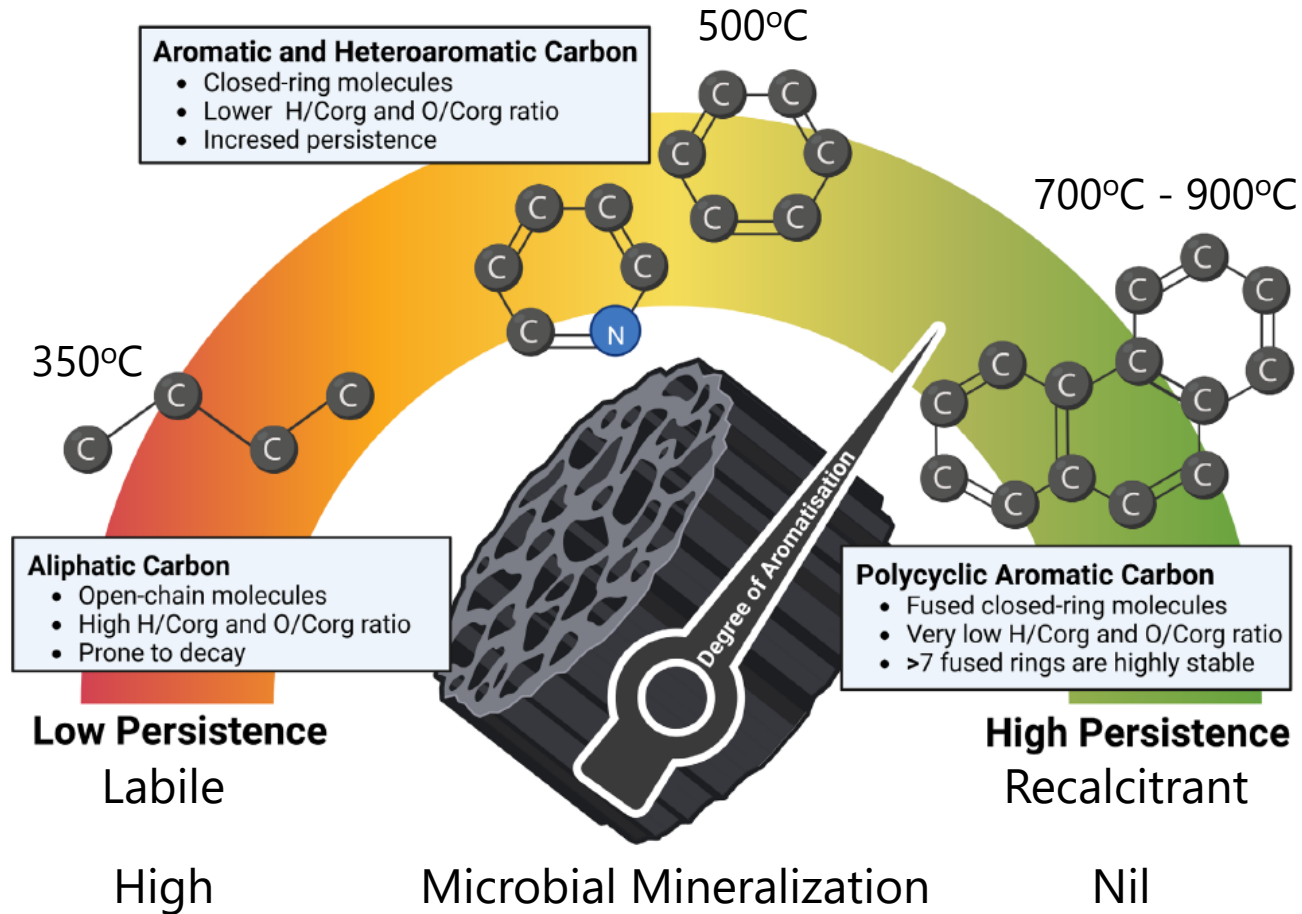
Financing: state processed bond to private investors



Earthcare, LLC Organics Processing Facility Biofilter Odor Control



Biochar – The Millennia Solution

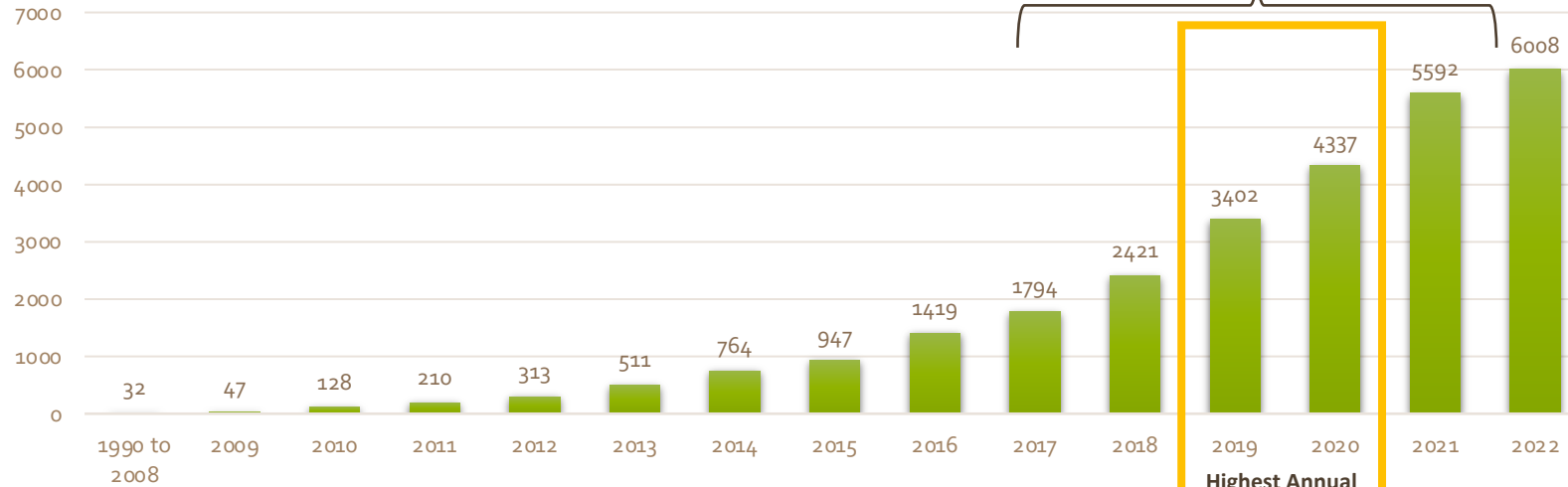


Using Organic geochemistry and petrology methodologies determine that biochar:

- With increasing temp., carbon increase, H/C & O/C decrease
- At 500°C+ 97% TOC is almost infinitely geochemically stable lasting 1000 years or longer
- Limited semi persistent carbon (SPC) has been found to last 50 to 100 years.
- A more recent study indicates that 76% of commercial biochar can last millions of years.

No Longer a Boutique Industry...It's Booming!

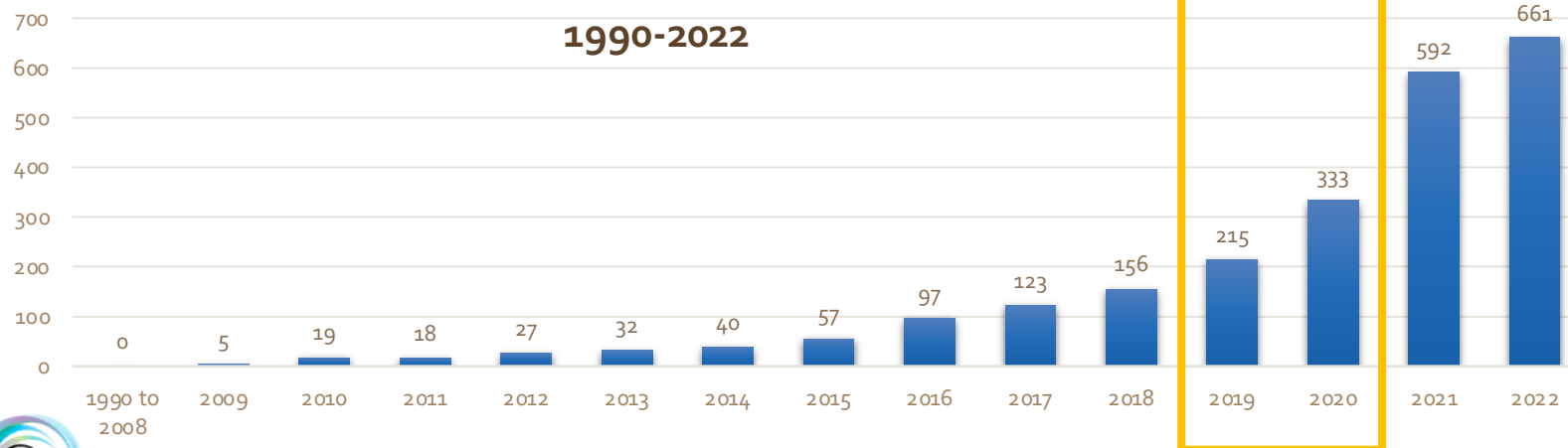
Web of Science Biochar Scientific Publications
1990-2022



5 YR Period Approx. 80% of Research Published

Highest Annual Growth

Web of Science Biochar Meta Reviews
1990-2022



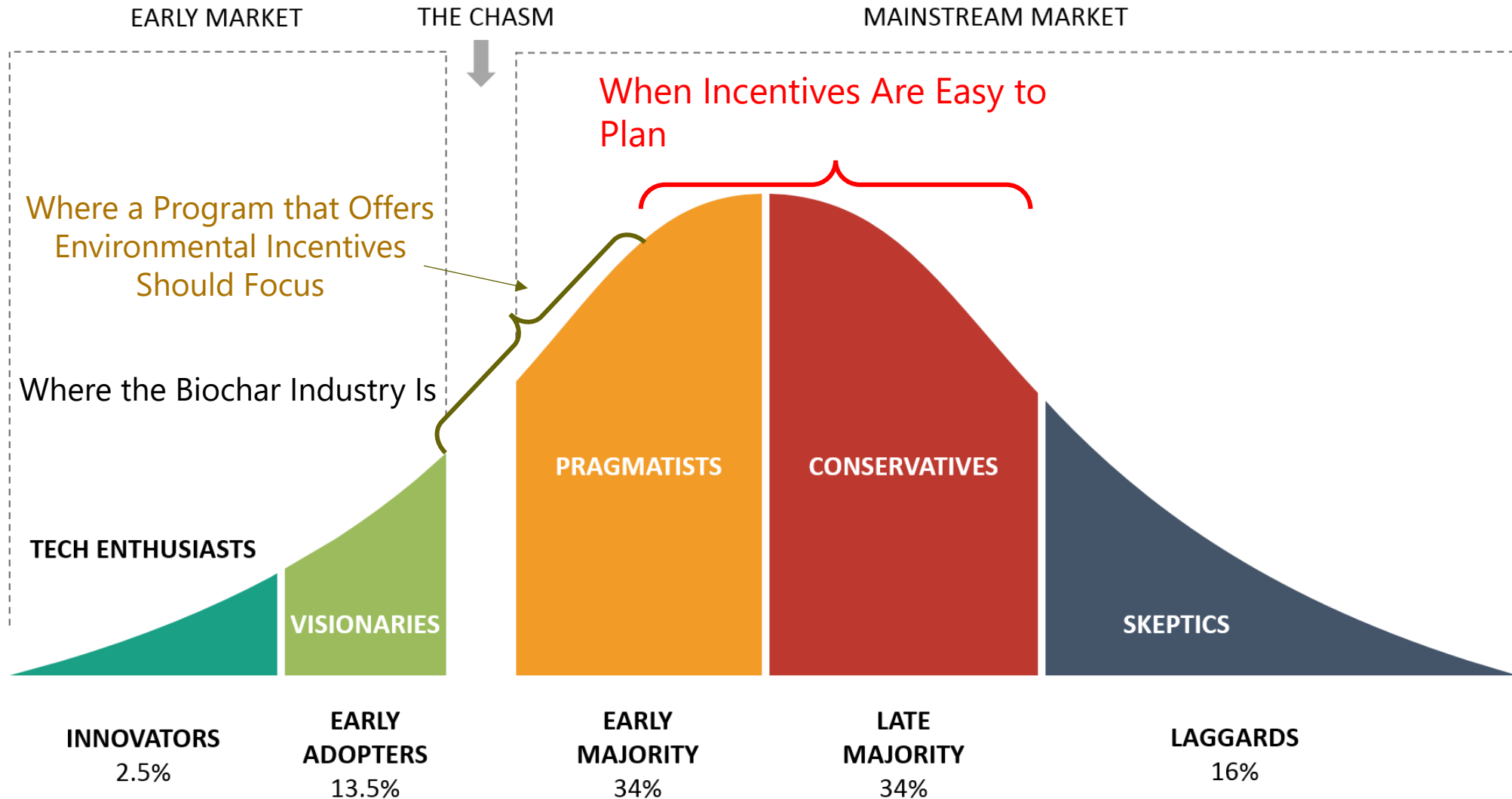
BIOCHAR RESEARCH METRICS

- 1ST recorded 'biochar' publication – 1998
- Dec. 2022 >27,925 publications
- 2,375 Biochar review articles
- >80% published in last 5 years



Web of Science (database: Web of Science Core Collection) – Biochar Research & Meta Review 1990-2022 completed by UN EFC 2022

Conservation Technology Adoption Curve



Biochar - Growing Markets



Carbon, Renewable Energy Offsets, and Building Products

Carbon markets, insetting, building products, odor control, batteries



Soil Health: Agriculture, Retail Garden, Landscape, Turf, Trees, Orchards, Vineyards, Horticulture

- Biochar, Compost, Composted biochar (5%-20% biochar), Fertilizers
- Animal bedding, litter, feed trials, Micro/nano carbons, nano-fertilizers
- Biotic Soil Amendments (biochar + organics+ minerals and biologicals)
- Granulated and liquid products for seeding, foliar sprays (extracts)



Environment, Remediation, Water Quality, Erosion Control

- **Revegetation, Biosolids**, Urban Soils Restoration, Erosion Control, Ecosystems Restoration & Remediation, Odor, Waste, Remediation Persistent Herbicides (USCC), PFOS/PFAS, Stormwater Filtration, Water Treatment



Forestry

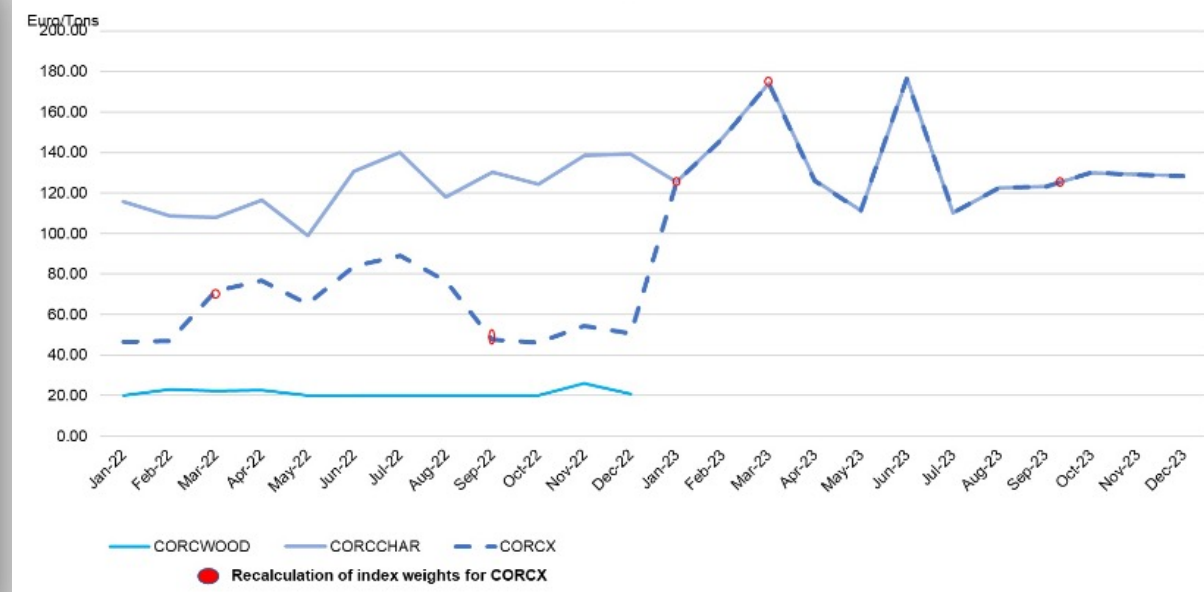
- **Wildfire fuel reduction**, Reforestation, Range Improvement, Growing media for nursery, Revegetation, Mine reclamation

Biochar - Voluntary Carbon Market

Figure 1. Voluntary Carbon Market Size by Value of Traded Carbon Credits, pre-2005 to 31 Dec. 2021



CO2 Removal Certificate Weighted Index Family (CORCX)



- Rapid growth in voluntary carbon market over last 3 years.
- Biochar production is now a major revenue source.
- Market growth expected to continue, driven by:
 - Corporate ESG commitments to Net Zero.
 - Rising consumer expectations.
 - Interest in Nature-Based Carbon Solutions:
 - *Biochar, Reforestation/Afforestation, Enhanced Rock Weathering, Terrestrial Biomass Storage & Soil Restoration.*

•Biochar supports 12 UN Sustainable Development Goals.

Puro.earth reference customers

"Carbon dioxide removal is a vital part of tackling the atmosphere's growing greenhouse gas concentration and we want to take responsibility for our carbon footprint. Collaborating with Puro.earth allows us to help expand the nascent carbon removal industry."

Elizabeth Willmott, Carbon Program Manager, Microsoft

"To stop global warming, it is not enough to limit emissions, but measures are also needed to remove carbon dioxide from the air. This is an exciting initiative to create economic drivers to accelerate the development."

Joachim Alpen, co-head of SEB's Large Corporates & Financial Institutions division.

"We were impressed how quickly Puro.earth was able to bring this marketplace to life. We had little time to reflect if this should become our first proof point for the company's net-zero ambition – which was not public yet at that time. Today we know it was the right decision to put the money where the mouth is and help Puro to grow roots."

Mischa Reppmann, Senior Environmental Mgmt Specialist, Swiss Re Group

Watershed

Shopify selected three Puro.earth carbon removal companies as part of their bold commitment to invest a minimum of \$5 million annually in the most promising and impactful technologies and projects to fight climate change globally.

"As a technology company we want to support technical changes that supports the essence of the net zero ambition and logic of science-based targets guidance. Our focus is on continued absolute emissions reductions, but supporting the development of carbon removals is an additional, important component in our climate strategy."

Hanna Duraku, Sustainability Manager, Telia Company

"To balance out our unavoidable residual emissions, we are supporting innovative carbon removal solutions. The urgency of the situation means we need to be proactive and help scale up the carbon removal industry, which is still in its infancy."

Alison Martin, CEO EMEA and Bank Distribution, and the Executive Committee member responsible for Sustainability

Biochar - Biosolids (PFAS/PFOS) Management



Point Sources

- Industrial sites that used or manufactured PFAS
- Military fire training areas, fire suppression, and storage areas
- Civilian fire training areas, fire suppression, and storage areas
- Wastewater treatment plant effluent
- Landfills

Nonpoint Sources

- Biosolids land application
- Stormwater runoff
- Septic systems
- Atmospheric deposition

Federal and academia responses only.

LOCAL NEWS | JAN 31

Advocates seek ban on Bloom fertilizer over forever chemicals concerns

Jacob Fenston

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Bags of Bloom for sale at a D.C. hardware store. DCist / WAMU

RELATED STORIES

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- 1A, APR 7, 2022: 1A Remaking America: The fight for abortion access
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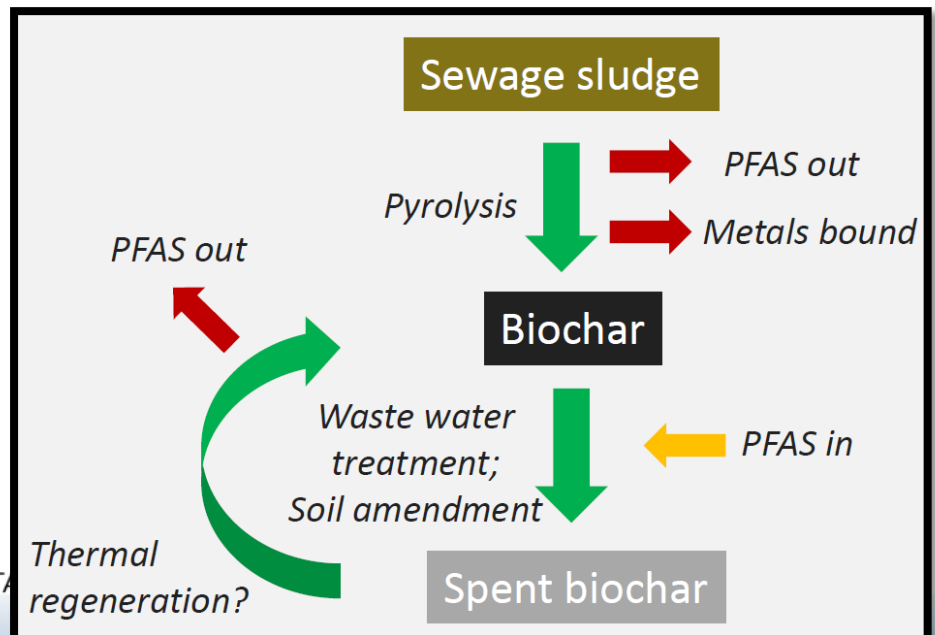
THE DIANE REHM SHOW, JAN 22, 2014: Access To Abortion 41 Years After

Biochar - Biosolids (PFAS/PFOS) Management



Earthcare, LLC Organics Processing Facility, Bethel PA

Sewage Sludge contains lots of PFAS



- ### PFAS/PFOS REMOVAL POTENTIAL
- Gasification can destroy +95% of PFAS in sludge
 - Less than 3% emitted in flue & can be reduced with biofilter
 - Sewage sludge biochars can effectively sorb 91.5-98.9% PFOS depending on temperatures created
 - Biochar pore sizes are the key to accommodating PFAS molecules

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Biochar in Compost – Working Together

- Both methods “*close the loop*” to recycle organic wastes
- “As an entrepreneur, anytime I can take a problem and turn it into an opportunity, that’s a win for me!”



- Pairing composting facilities with pyrolysis technology can provide economic advantages
- Not in competition for feedstocks, and can be combined for synergistic benefits
- Ideal compost materials: 60 – 70% moisture, high nutrient levels, and low lignin content.

- Ideal biochar feedstocks: 10 – 20% moisture & high lignin content
 - Biochar contains upwards of 70 - 90% stable C, while compost contains between 2 -14% stable C but greater nutrient availability



Photo: Utah Soil Health Program

Biochar – The Ultimate Circularity Solution in Organics

Questions & Answers

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Deadlines for some provisions of the ITC and PTC available under the Inflation Reduction Act will twilight on December 31, 2024, so don't miss your chance to act.



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Wendy Lu Maxwell-Barton
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