

Operationalizing Sustainable Development: Information Gathering Workshop 2 Global Strategies, Part 2

BIOCHAR

Safe, Scalable & Shovel-ready



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AGENDA

What is biochar?

What is happening within the biochar space?

- Academically
- Commercially

Framing biochar: not just about carbon sequestration

Challenges

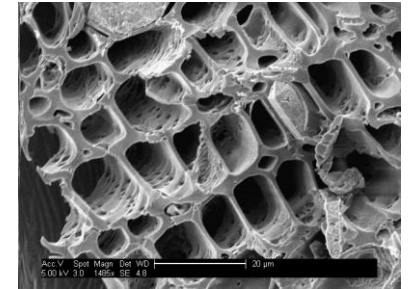
Lessons Learned

Key Research & Policy Priorities

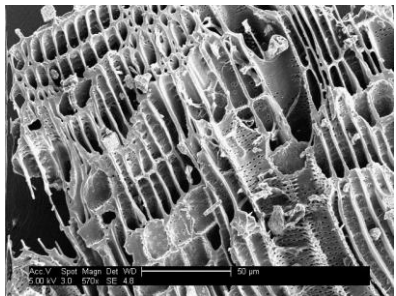


What is Biochar, Carbonization & PYCCS?

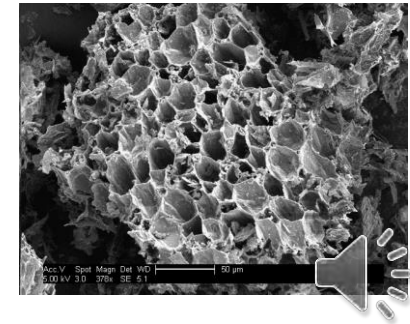
BIOCHAR: organic matter (e.g., crop residues, invasive species, manures, woody biomass, etc.) heated in an oxygen limited environment at high temperatures. Converts up to 50% of original carbon content into stable carbon which, when buried in soil or embedded in other long-lived products, does not return to the atmosphere as it would normally during decomposition.



CARBONIZATION: thermo-chemical conversion of organic matter heated in oxygen limited environment (pyrolysis or gasification). Depending on the technology, the co-products generated include: heat, biochar, bio-oil, wood vinegar and/or syngas.



PyCCS: Many pyrolysis technologies produce solid, liquid and gaseous pyrolysis products. To date most of the sequestration focus has been on the solid fraction (i.e., biochar). However, the liquids (i.e., bio-oil) can be injected into deep wells elevating carbon sequestration potential to >70% of the original biomass.



What is Biochar?

	Charcoal	Biochar	Activated Carbon
Feedstock	Hardwood, sawdust + Binding Agents	Ag, forestry & other organic materials/waste	Coconut shells, peat, coal, petroleum pitch
Common Uses	Fuel (Cooking)	Soil Amendment Remediation Filtration Binding Agent (livestock)	Filtration Odor Control Remediation Binding Agent (humans)
Relevant Qualities	Burnability Low smoke	Adsorption/Porosity CEC Sequestration	Adsorption
Cost	\$ - \$\$	\$\$	\$\$\$
Production	Slow Pyrolysis; Kiln	Slow Pyrolysis; Kiln; Gasification	Pyrolyzed at 600 – 900C + activated at 250C OR Chemically impregnated & cooked @ 450 – 900C
Carbon Footprint	Carbon Neutral: May lead to Deforestation	Carbon Negative (in many situations)	Carbon Positive



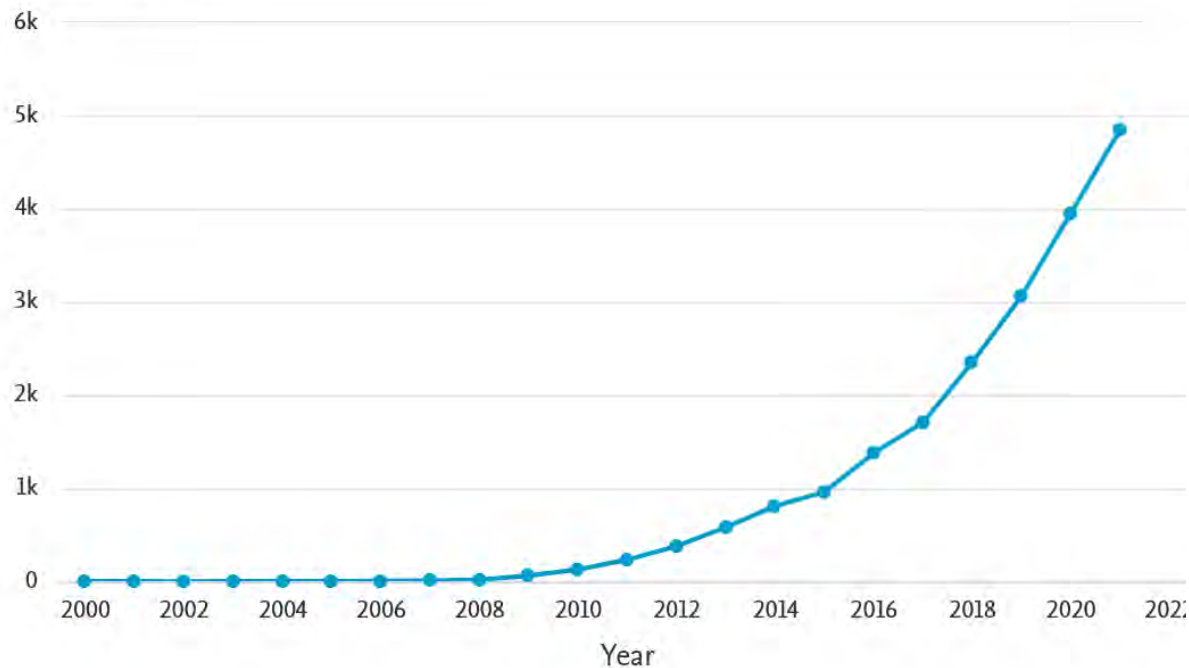
IBI definition of biochar based on:

1. Carbon content
2. Recalcitrance (H/C ration $\leq .7$)
3. Safety (heavy metals, PAHs)

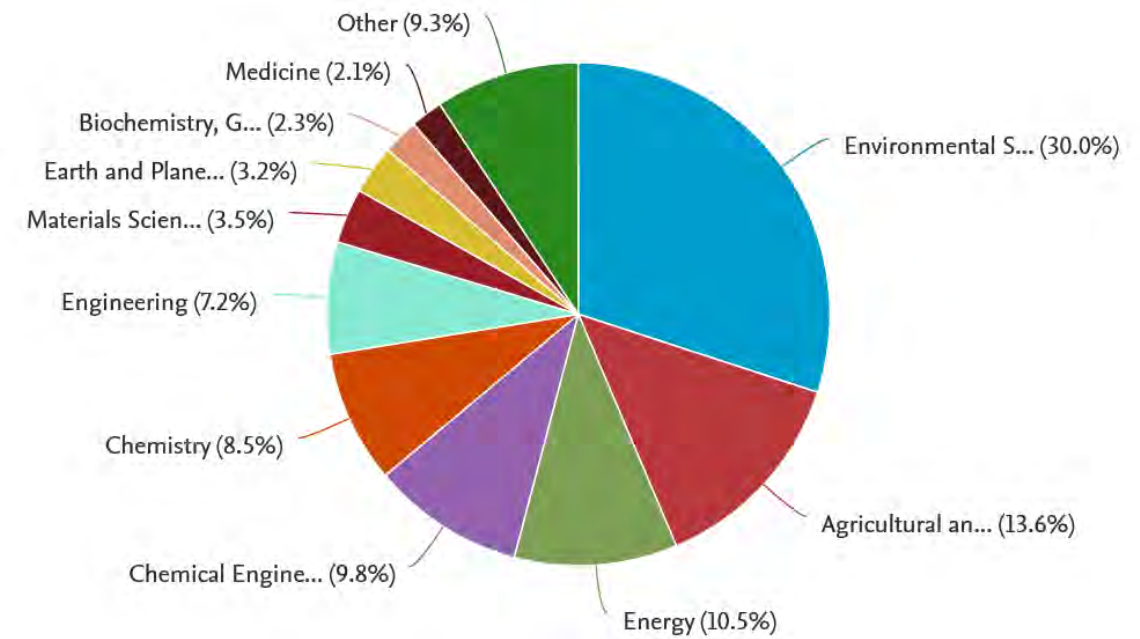


What is happening in Academia re: biochar?

Documents by year



Documents by subject area



Scientific articles published including the keyword “biochar” in SCOPUS



What is happening commercially with biochar?

- Carbon Markets
- Production
- Biochar Production Technologies
- Markets



Carbon Markets



<https://puro.earth/>



<https://www.carbonfuture.earth/>



<https://verra.org/methodology/methodology-for-biochar-utilization-in-soil-and-non-soil-applications/>



CLIMATE
ACTION
RESERVE

<https://www.climateactionreserve.org/how/protocols/biochar/dev/>



Biochar Production

- US 2021 – estimated at 100,000 tons per year
- Scaling depends on biochar market development
 - Could scale quickly if high value markets develop
 - Leverage pellet plants & charcoal manufacturers
- ~200 producers, mostly small
- Mostly made from wood



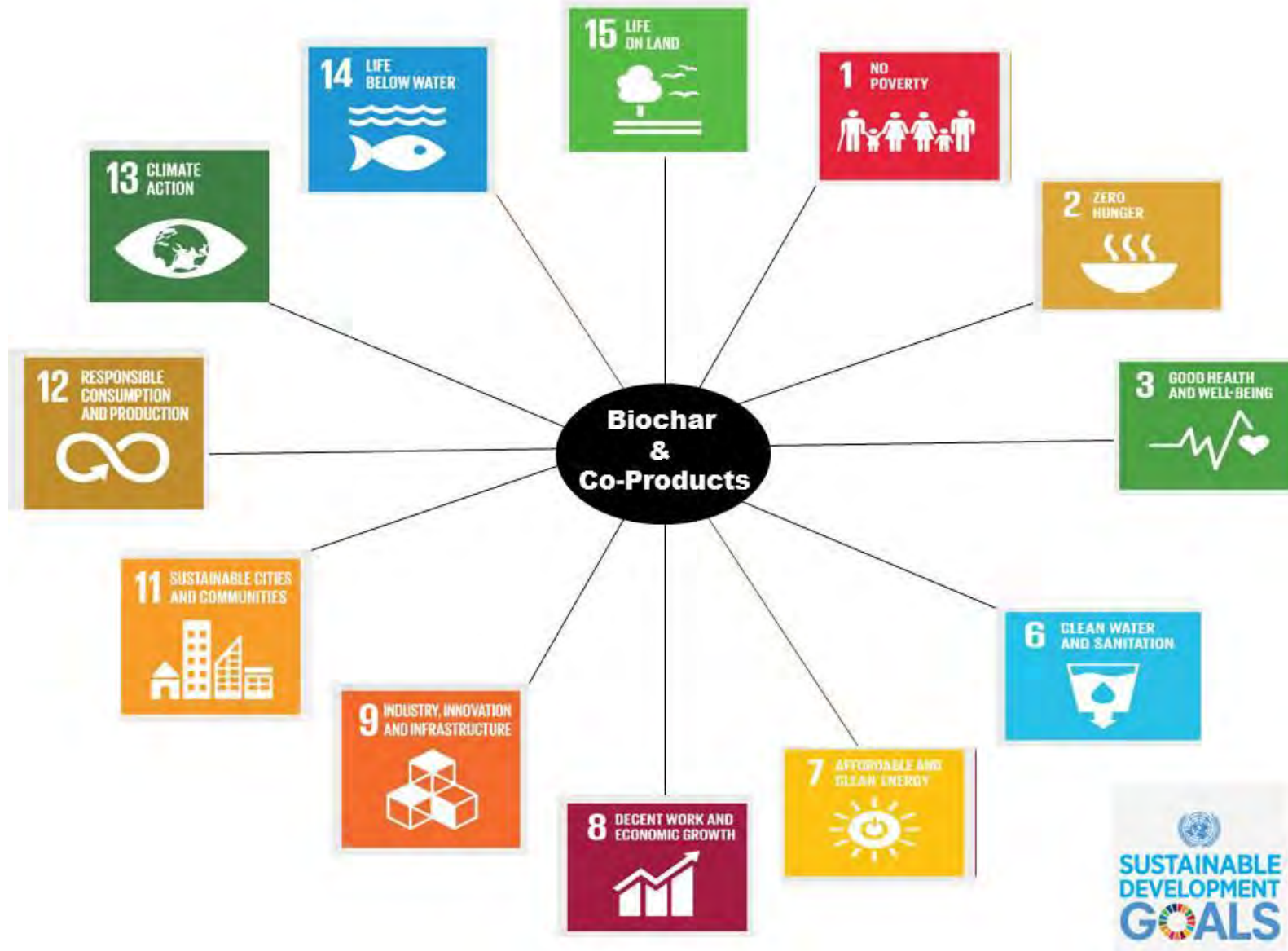
Biochar Production Technologies



Additional:
 Compost
 Storm water management
 Anaerobic Digestion
 Bedding/Litter
 Capping oil/gas wells
 Cosmetics



Framing biochar



Challenges

- Value Proposition
- Few know what it is
- Few understand biochar variability & which biochars are best for different uses
- Pyrolysis is often confused with incineration
- Market demand is constraining growth
- Fear of 'feedstock vs food'



Lessons learned

- Raw biochar can retard yield benefits
- Meta-analysis can be challenging
- Not everyone wants to hear about climate benefits
(and that's ok)



Key Research

- More *applied* research to develop specifications
- NDC biochar framework (by country & state)
- Biochar decarbonization roadmap by industry
- Engineered feed char for methane reduction
- Biochar & methane mitigation
- Low cost, high C efficient pyrolyzers

- Create an international Carbon sink registry where all C-sinks are documented including their persistence
- Develop analytical methods that better predict the persistent fraction of biochar when applied to soil
- Biochar basalt composites for enhanced carbon drawdown
- Biochar liquid fertilizers
- for enhanced growth within the rhizosphere
- Biochar foliar spray as both growth enhancers and biopesticides



Key Policy Help Needed

- FDA – feed char
- Educate IPCC & COP negotiators
 - Connect State Dept with USDA NRCS, USFS,
- Access to Capital
 - Loan guarantees
 - Tax credits
- Preferential purchasing for low embodied carbon products
- Biochar as preferred cement/asphalt additive

