WELCOME!

The Virginia Soil Health Coalition

Quarterly Meeting

February 26th, 2025

Virginia Association of SWCD Soil & Water Conservation Districts

VABF Virginia Association for Biological Farming

Sustainable Chesapeake

Common Grain Alliance

SARE Sustainable Agriculture Research & Education

James River Association

Conservation Management Institute

DCR Virginia Department of Conservation & Recreation

Foodshed Capital

Piedmont Environmental Council Serving Virginia's Piedmont since 1972

Alliance for the Shenandoah Valley

Virginia Working Landscapes

Old Dominion Land Conservancy

Virginia State VSU College of Agriculture

Grazing Alliance

Wills Soil & Stream

American Farmland Trust

Thomas Jefferson Soil & Water Conservation District

Chesapeake Bay Foundation Save the Bay

VT College of Agriculture and Life Sciences Virginia Tech Center for Food Systems and Community Transformation

Virginia Cooperative Extension Master Gardeners

VT College of Agriculture and Life Sciences School of Plant and Environmental Sciences Virginia Tech

Ferrum College

pH natural pHuel

Alliance to Advance Climate-Smart Agriculture

Soil and Water Conservation Society

Colonial SWCD Soil & Water Conservation District

VFGC

Piedmont SWCD Soil & Water Conservation District

Green Fin Life in a Bottle

Appalachian Sustainable Development

NRCS Natural Resources Conservation Service

Fauquier Education Farm

Conservation Innovation Fund

Maryland & Virginia Milk Producers Cooperative Association

20 20

Farm Bureau Virginia

Conservation Partners

Virginia No-Till Alliance Vantage

Environmental Institute Virginia Turfgrass Council

American Climate Partners Rural resilience through environmental restoration

Smith Creek Watershed Partnership

Luck Ecosystems

NCAT Soil for Water

Alliance for the Chesapeake Bay

Virginia Cooperative Extension Virginia Tech • Virginia State University

Virginia Agribusiness Council

Thank you to our funders!

National Fish and Wildlife Foundation
NFWF
Chesapeake Bay Stewardship Fund

United States Environmental Protection Agency

Chesapeake Bay Program
Science. Restoration. Partnership.

Agua Fund, Inc.

DCR
Virginia Department of Conservation & Recreation

Southern SARE
Sustainable Agriculture Research & Education

Chesapeake Bay Trust

NRCS
Natural Resources Conservation Service

Agenda

- Grower's Corner: Soil Health Steward Feature
- Advancing Biochar and Compost Research in Virginia: Insights and Applications for Agriculture
  - Dr. Vijay Chaganti, Assistant Professor and Extension Specialist, School of Plant and Environmental Science, Virginia Tech
- USDA and Federal Programs Update: Emerging Priorities and Uncertainties for 2025
  - Chris Young, Director of Governmental Affairs, National Association of Soil and Water Conservation Districts
- Conservation "Speed Dating" Breakouts
- Final updates and announcements

Breakout Groups

- Round Robin
  - Introduction
  - What strengths or resources can you/your org bring to the agriculture and conservation space right now?
  - Where could you use additional support from others?
- As a Group
  - What is the opportunity for partnership right now in this current landscape and amid uncertainty?
  - If time: Any resources you would like to share with the group?

Virginia Soil Health Coalition

2024 Annual Report

Mary Sketch Bryant, Director, Virginia Soil Heatlh Coalition

Our vision

Healthy soil supporting productive farms, thriving ecosystems, and resilience communities

Our mission

The Virginia Soil Health Coalition strengthens and supports a broad collaborative network that improves and expands soil health across all of Virginia's landscapes.

We believe in:

- Leveraging the power of a network that represents all of Virginia's diverse landscapes and communities
- Pursuing and sharing new and innovative science-based solutions
- Enhancing the resilience, productivity, and profitability of Virginia's farms
- Including and engaging all people who care for Virginia's lands, especially those who have been historically marginalized
- Protecting and nourishing Virginia's soil to benefit future generations of people, farms, communities, and natural resources.

Priorities:

1. Build the Coalition's capacity for leadership and expansion
2. Enhance partner collaboration to drive innovation, implementation, and impact
3. Cultivate awareness through education, outreach, and advocacy

Virginia Cooperative Extension
Virginia Tech • Virginia State University

Advancing Soil Health across Virginia in 2024

Productive Farms, Thriving Ecosystems, Resilient Communities

The Virginia Soil Health Coalition (VSHC) is a growing statewide network of agency, nonprofit, and academic partners that is embedded in Virginia Tech and Virginia Cooperative Extension. The VSHC was formed to strengthen and support a broad, collaborative network that improves and expands soil health across all of Virginia's landscapes. The Coalition has been transformed over the last three years from an informal group of 12 organizations who endorsed Virginia USDA-NRCS' four core soil health principles to a diverse network of 47 public and private organizations working across the Commonwealth to increase awareness and implementation of practices that build soil health.

As a convener and coordinator, the Coalition has a unique, birds-eye view of what is happening on the ground, where there are gaps, and where there are opportunities for innovation and collaboration. By coordinating partners to address these gaps and opportunities, the network plays a key role in accelerating implementation to reach state and national water quality, climate, and other economic and environmental goals. Led by a Steering Committee, the VSHC serves as a convener, communicator, and coordinator. Our impacts since the Coalition was formalized in 2021 include:

- 47 partner organizations, growing from original 12
- 11 quarterly meetings (average 75 participants per meeting)
- 92 podcast episodes with >15,000 downloads
- Outreach at 45 events reaching >5,000 people
- >$2.5M in funding received through the VSHC for collaborative soil health work
- 14 soil health trainings reaching over 200 practitioners
- >20,000 acres of no-till, cover crop, and rotational grazing through farmer-to-farmer mentoring.

The Coalition continues to expand, developing new partnerships and collaborations across the state and the entire Chesapeake Bay region in support of **our Strategic Plan** that runs through 2025. We have continued to expand our outreach and education efforts across the state with a specific focus on engagement of historically underserved producers. We look forward to continuing to innovate through programming and network development in 2025.

Reminders

- Share your logo in support of the Coalition’s mission, vision, and principles.
- Visit the website and sign up for the newsletter: **virginiasoilhealth.org.**
- Take the pledge and download the podcast: **4thesoil.org.**
- Reach out to us about project ideas and grant proposals.
- Have a topic you want to hear more about or want us to bring a speaker in- let us know!

Advancing Biochar and Compost Research in Virginia: Insights and Applications for Agriculture

Vijay Chaganti, PhD

Assistant Professor & Extension Specialist
Byproducts Management and Use
School of Plant and Environmental Sciences

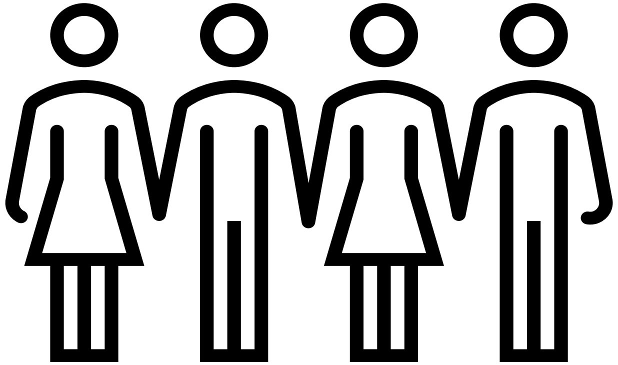
Virginia Soil Health Coalition Meeting
February 26, 2025

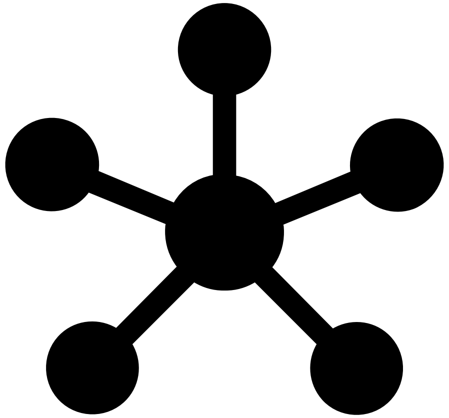
COLLEGE OF AGRICULTURE AND LIFE SCIENCES
SCHOOL OF PLANT AND ENVIRONMENTAL SCIENCES
VIRGINIA TECH

Virginia Cooperative Extension
Virginia Tech • Virginia State University

Responsibilities:

- Research (50%)
- Extension & Outreach (50%)





Byproducts

Byproducts refer to the materials that are produced as a result of agricultural, industrial and other processes that are not the primary products but have the potential to be reused for beneficial purposes

Organic

- Agricultural Residues
- Animal manures
- Food industry wastes
- Sewage sludge
- Paper mill sludges

Inorganic

- Dredge spoil material
- Quarry byproducts
- FGD Gypsum
- Coal ash

Research Program

Benefits

- C sequestration
- Organic Matter
- Nutrient addition
- Soil erosion & stormwater runoff control
- Soil reclamation

Byproducts

- Treatment processes
- Compost production
- *Biochar Production?*

Risks

- Nutrients (N, P)
- Antibiotics
- Heavy metals
- Contaminants of Emerging concern
- Food chain impacts
- *Climate change impacts?*

Sustainable/Regenerative Agriculture

Extension & Outreach Program

Research >>>>>>>>>>><<<<<<<<<<Extension

Stakeholder Engagement

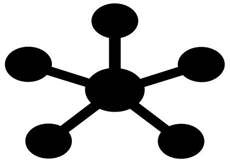
- Communication
- One-on-one talks
- SACs/SAC meetings
- Field days
- On-Station/On-Farm demonstration plots

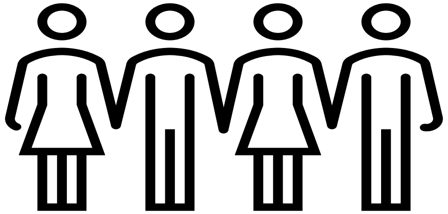
Stakeholders

- Extension agents
- Producers
- Commodity groups
- Regulatory agencies
- Policy makers
- Compost producers
- Industry personnel
- Waste managers(water utilities)
- Citizens
- Landowners

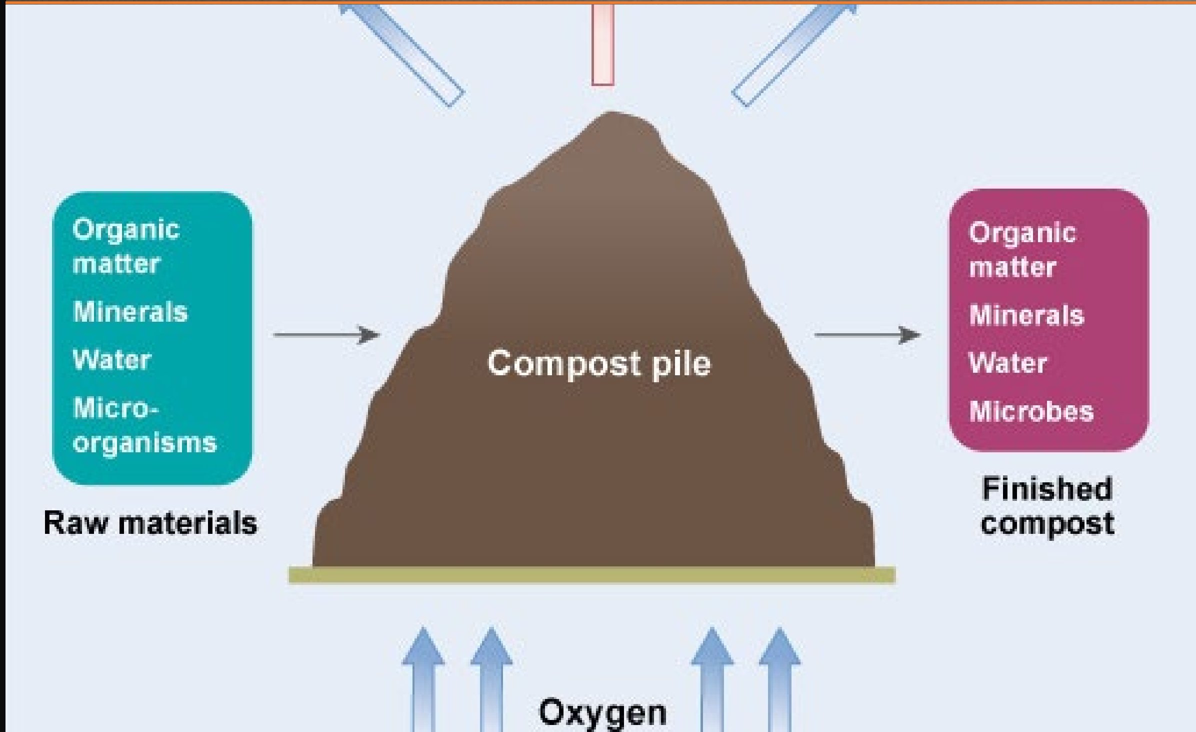
Information Dissemination

- Factsheets
- Extension Bulletins
- Newsletters
- Seminars/Webinars
- Surveys
- Social media



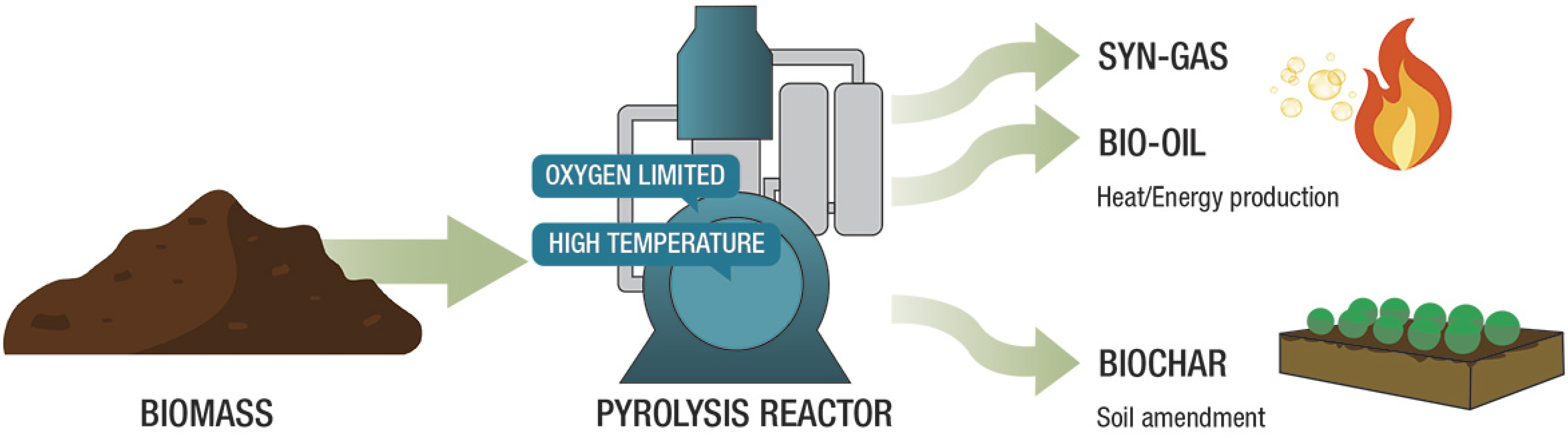


• Compost making: Composting



Biochar Making

FIGURE 1 General diagram of the pyrolysis process



Biochar, compost & Soil Health

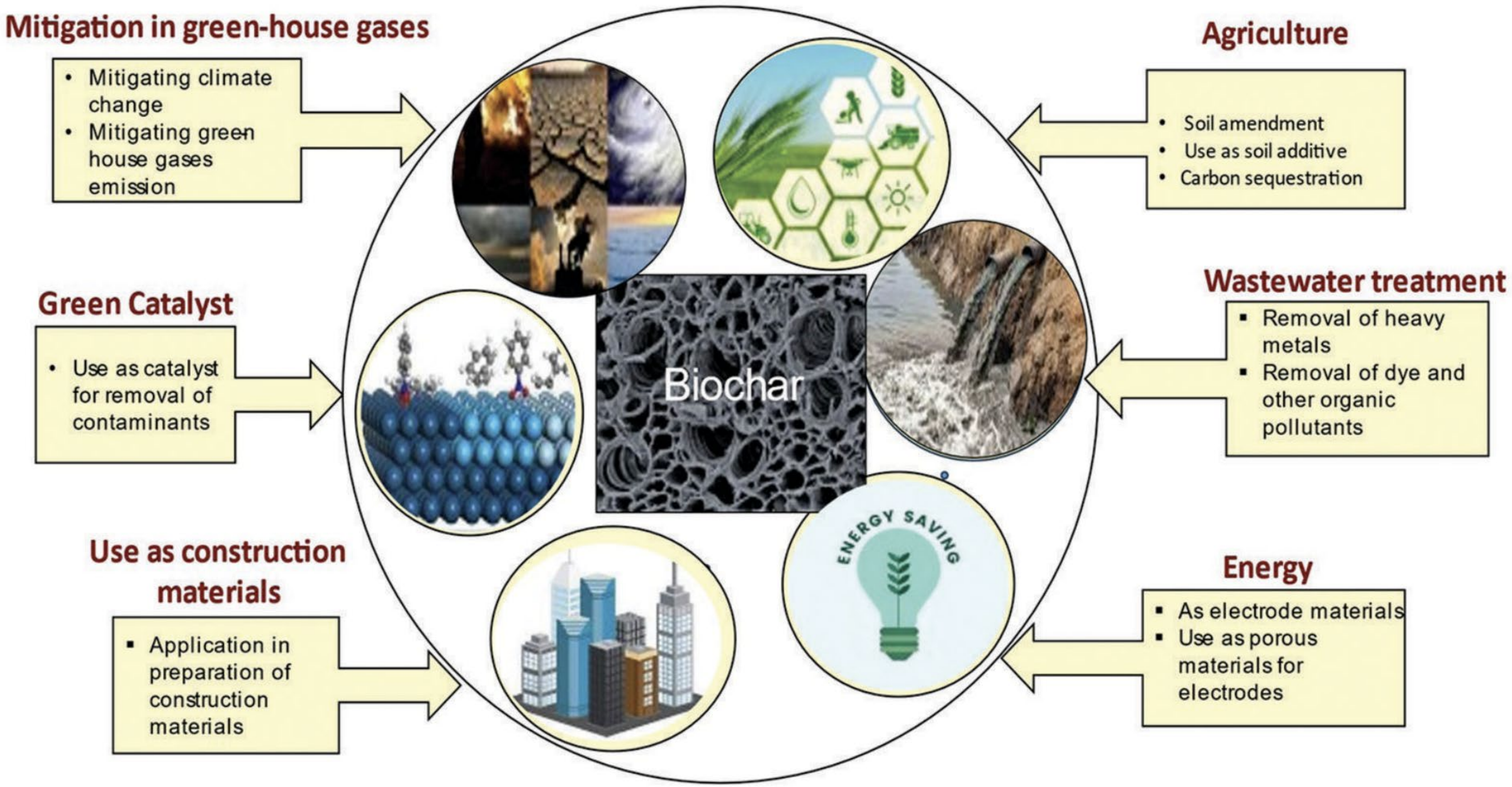
Physical Quality
- Density
- Porosity
- Aeration
- Aggregation
- Water retention

Chemical Quality
- pH alteration
- Increase CEC
- Nutrient holding Capacity
- Elemental balance

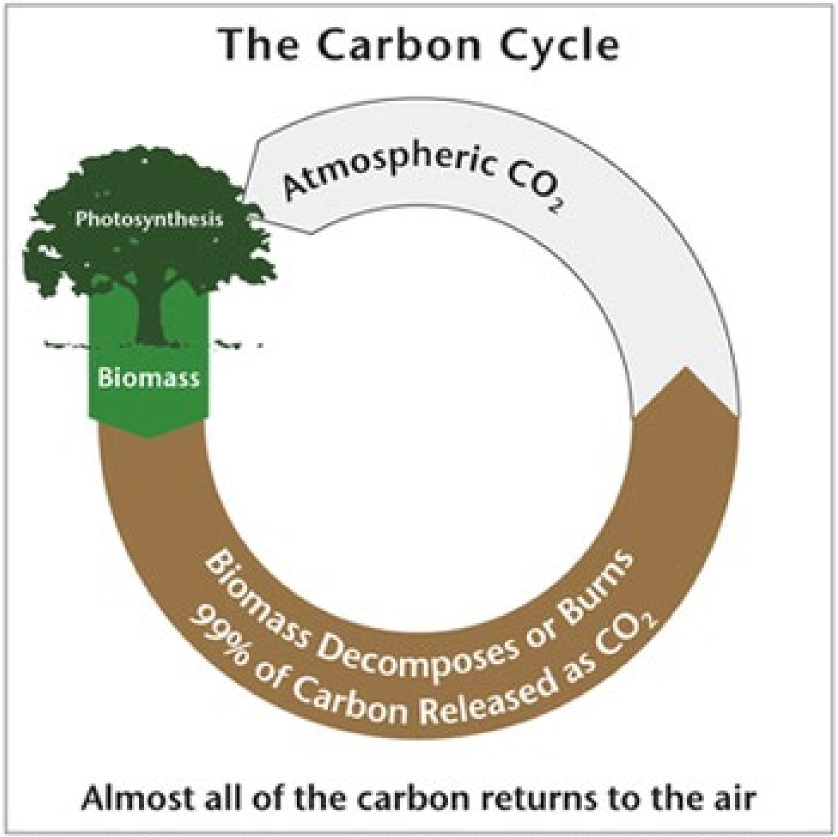
Biological Quality
- Microbial biomass
- Microbial Diversity
- Enzyme activity
- Root development

Biochar: Black is the New Green

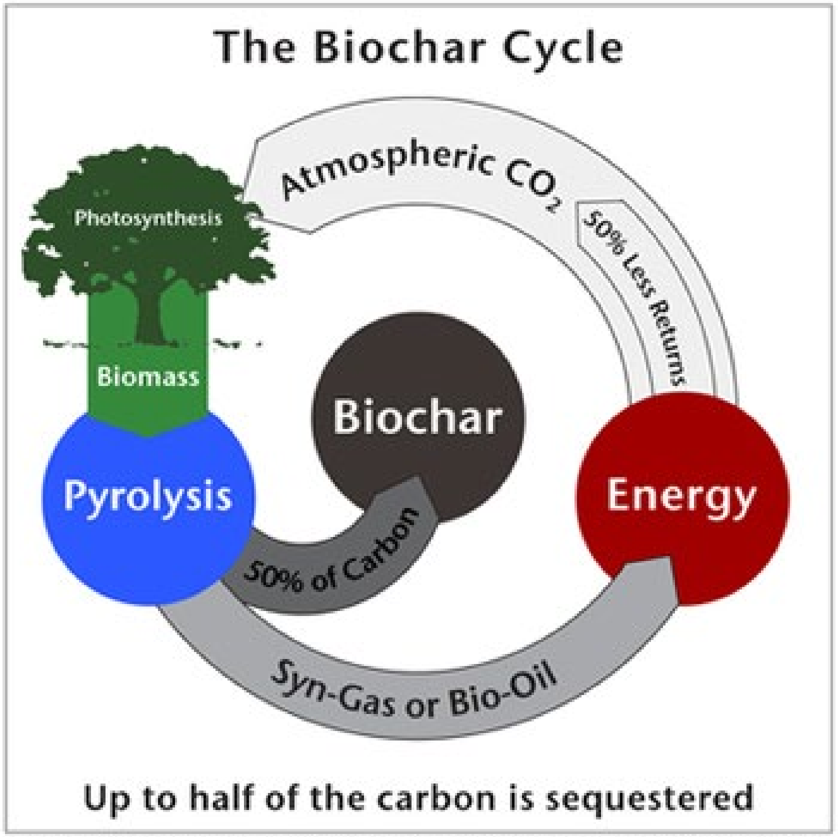
Additional Biochar Benefits



(Source: Kapoor et al., 2024)



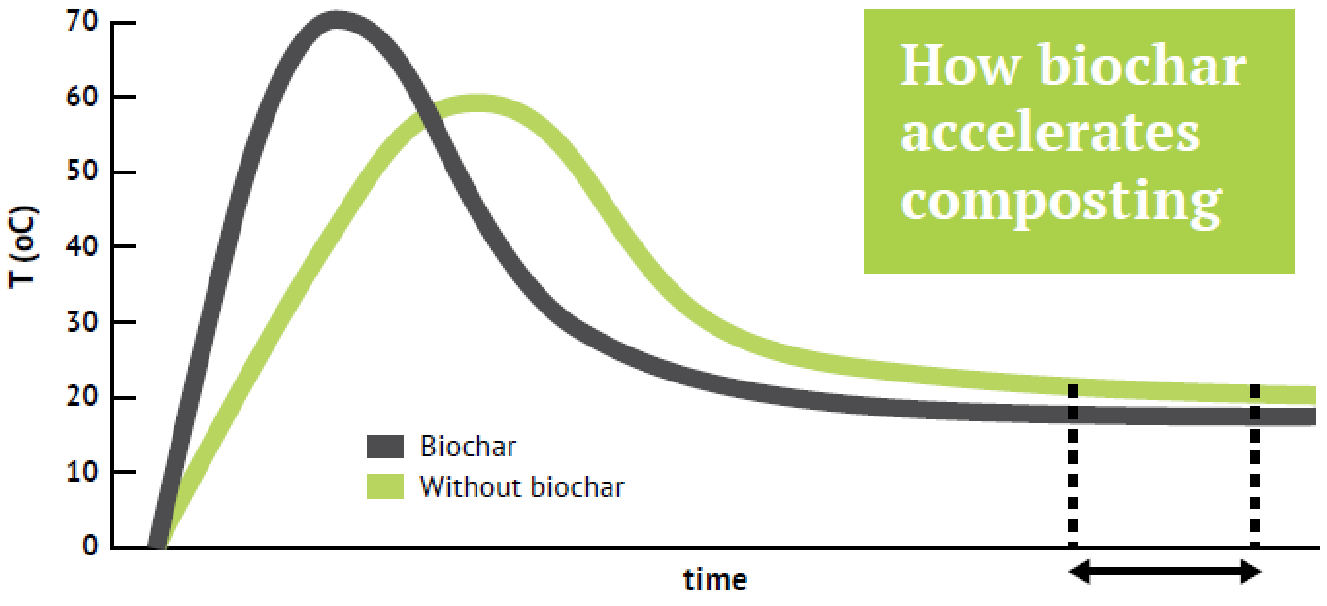
Green plants remove CO_2 from the atmophere via photosynthesis and convert it into biomass. Virtually all of that carbon is returned to the atmosphere when plants die and decay, or immediately if the biomass is burned as a renewable substitute for fossil fuels.



Green plants remove CO_2 from the atmophere via photosynthesis and convert it into biomass. Up to half of that carbon is removed and sequestered as biochar, while the other half is converted to renewable energy co-products before being returned to the atmosphere.

Co-composting with Biochar

- Accelerates composting
- Reduces nutrient losses
- Reduce GH emissions
- Bulking agent
- Increases Microbial activity
- Odor reduction



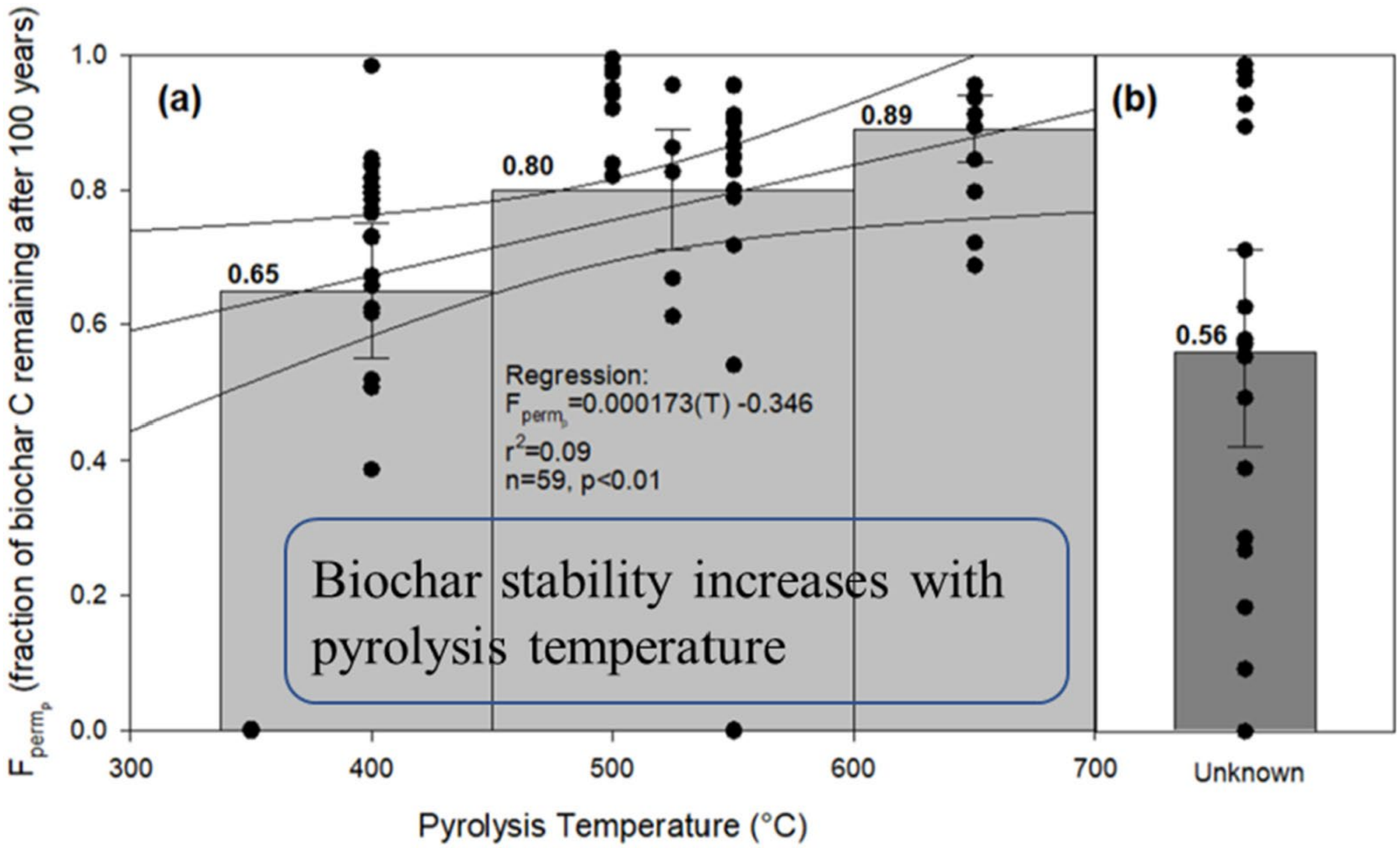
Compost vs Biochar Characteristics

Feature	Compost	Biochar
Origin	Decomposed organic matter	Pyrolysis of biomass
Decomposition	Rapid	Slow, stable
Nutrient Availability	Readily available	Can enhance availability, but not a direct source
Carbon Sequestration	Short-term	Long-term
Structure	Mixture of organic matter, microorganisms, and minerals	Porous, high surface area, high carbon content
Color	Dark brown or black	Black

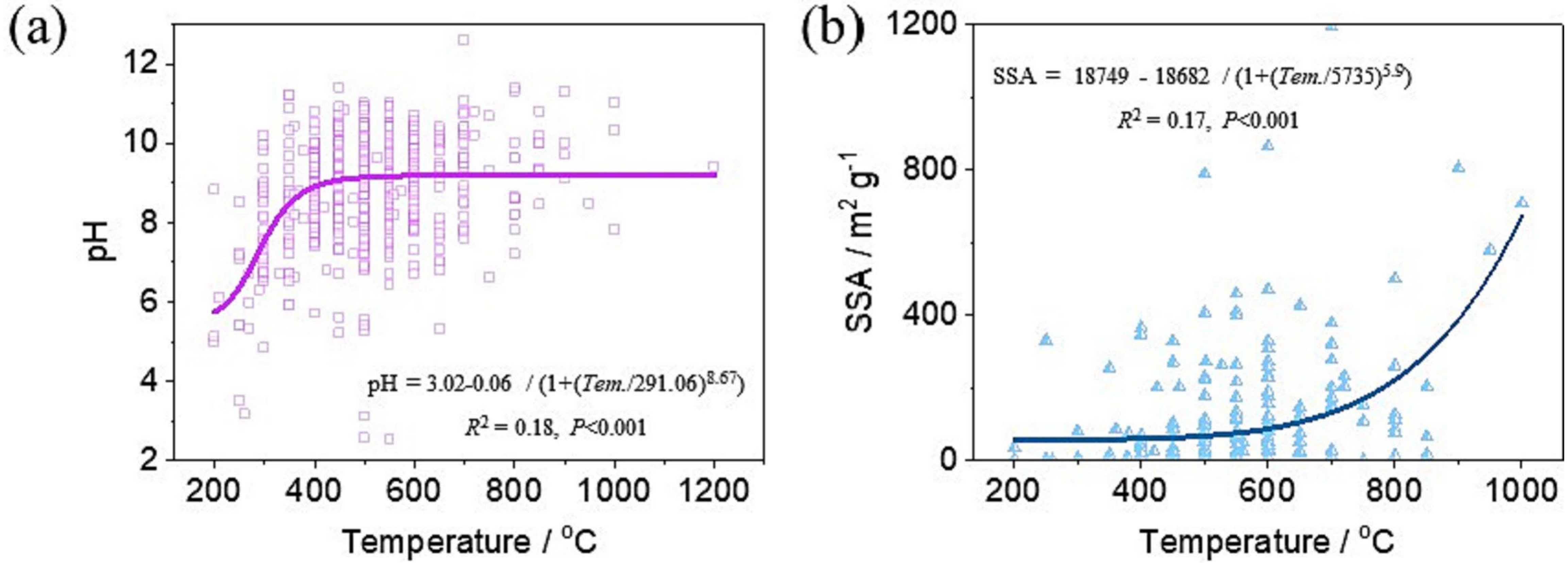
Biochar Characteristics

Biomass feed stocks
- Woods
- Grasses
- Manures
- Sewage sludge

Pyrolysis conditions
- Temperatures
- Residence time



Source: Wang et al., 2022)



(Source: He et al., 2024)

Designer Biochars

…tailor biochars with specific characteristics to address specific soil issues/deficiencies

- Carbon stability (↑ pyrolysis temps)
- Nutrient retention (aged, ↑ temps
- Water holding capacity (Grasses, ↓ temps)
- pH (manures, ↑ temps)
- Soil aggregation (woods, ↑ temps)
- Heavy metal remediation (manures)

Past Research

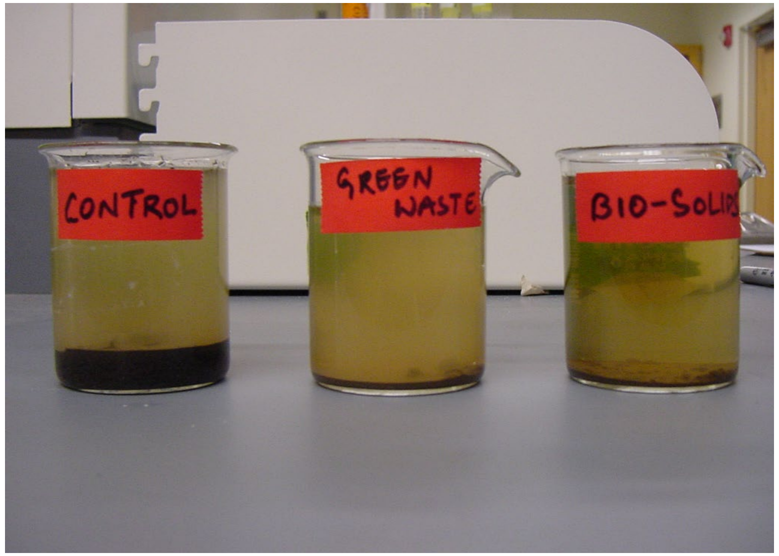
Soil Erosion and Stormwater Management in Urban Soils

- Two different experiments to evaluate potential of biosolids compost and greenwaste composts to reduce soil erosion and stormwater quality
  - Fire-damaged hill slopes
  - Construction site hill slopes

Soil Erosion and Stormwater Management in Urban Soils

- Greenwaste and biosolids composts applied as two depths 2.5cm and 5cm thick mulch layers.
- Three natural rainfall events
- Stormwater runoff quantity and quality – Concentrations and mass transport
  - Sediments
  - Nutrients (N, P)
  - Total dissolved solids
  - Total suspended soils
  - Trace metals

Soil Erosion and Stormwater Management in Urban Soils - Conclusions



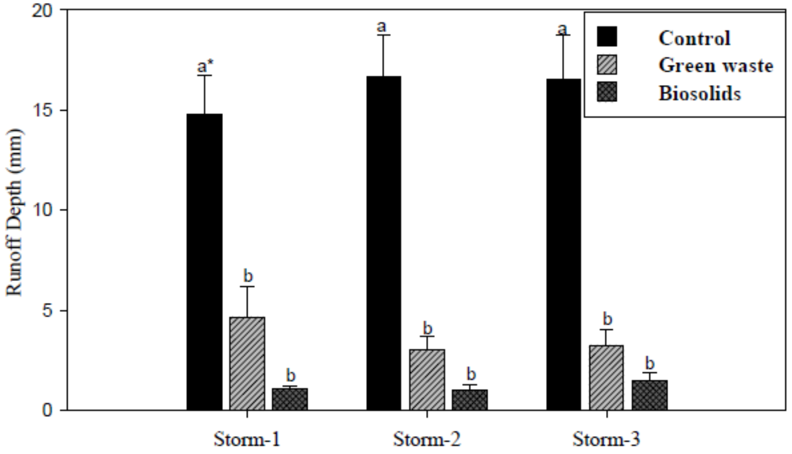
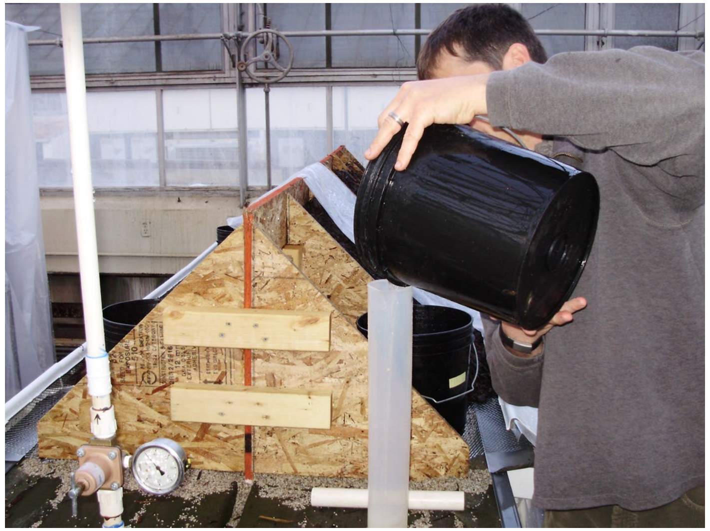


Figure 2. Mean runoff depth (mm) during three rain events. Common letters between treatments for each storm indicate no significant differences ($p < 0.05$, Tukey's test).

- 85% Reduction in runoff volumes from compost plots
- 90% Reduction in sediment transport.
- Concentrations of N and P were higher from biosolids compost.
- But mass-based N and P offsite transport is significantly reduced.
- Heavy metal concentrations were detected but again their mass transport was negligible.

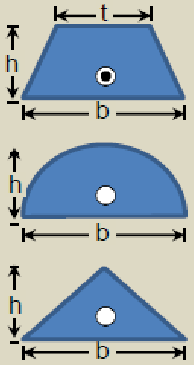
Compost production BMPs



Storage Potential Calculator

	Wet Weight (g)	Dry Weight (g)	Moisture Content
Field Capacity Sample:	500	100	80%
As-received Sample:	200	90	55%
Material Bulk Density:	1000	lb/yd^3	

Storage Capacity: 1.5 inches compost/inch rain



Pile Dimensions (ft)

Pile length:	50
Pile height (h):	5
Bottom width (b):	12
Top width (t):	2

Rain Storage Capacity
73400 gallons
196.2 inches

White regions indicate required information.

Reclamation of Saline-Sodic Soils with Composts and Biochar

Gypsum is traditional soil amendment to reclaim saline-sodic soils

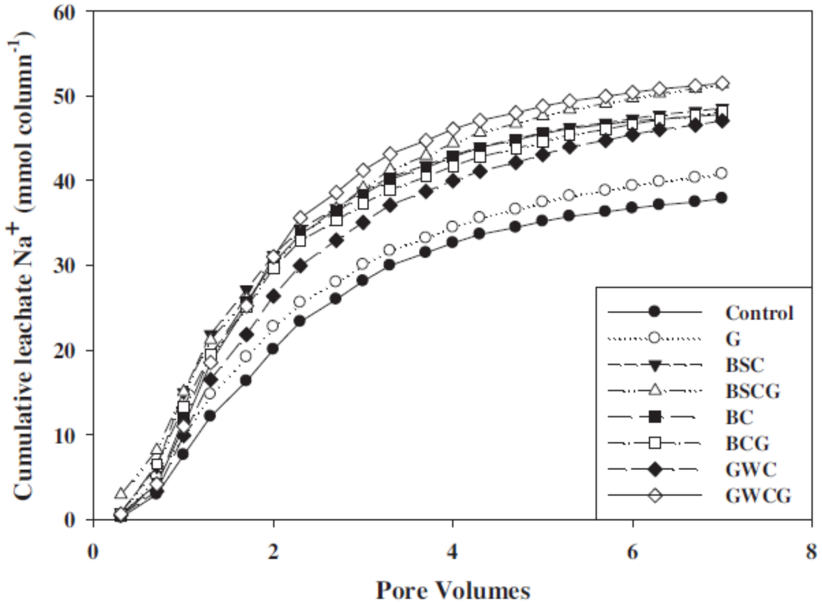
Literature suggests organic amendments (composts) improve soil structure

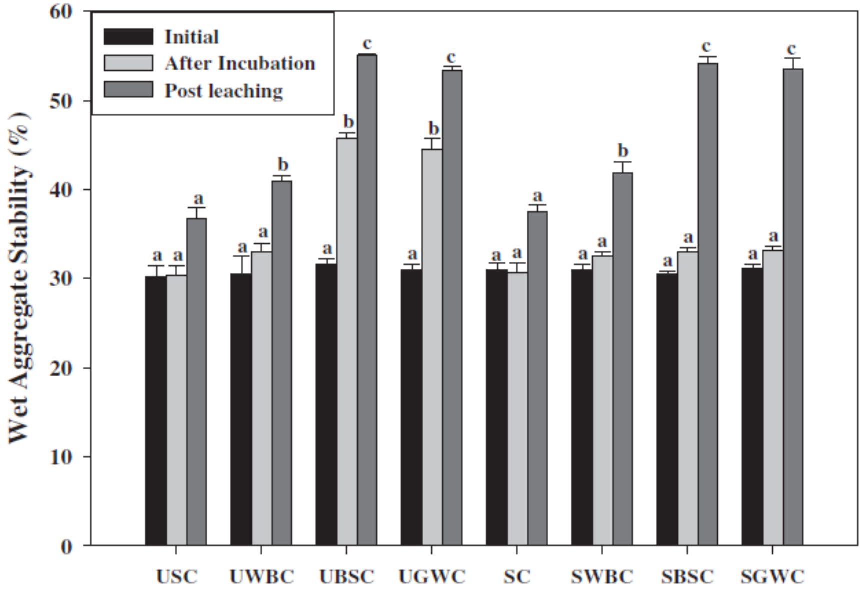
Biochar as a potential soil amendment

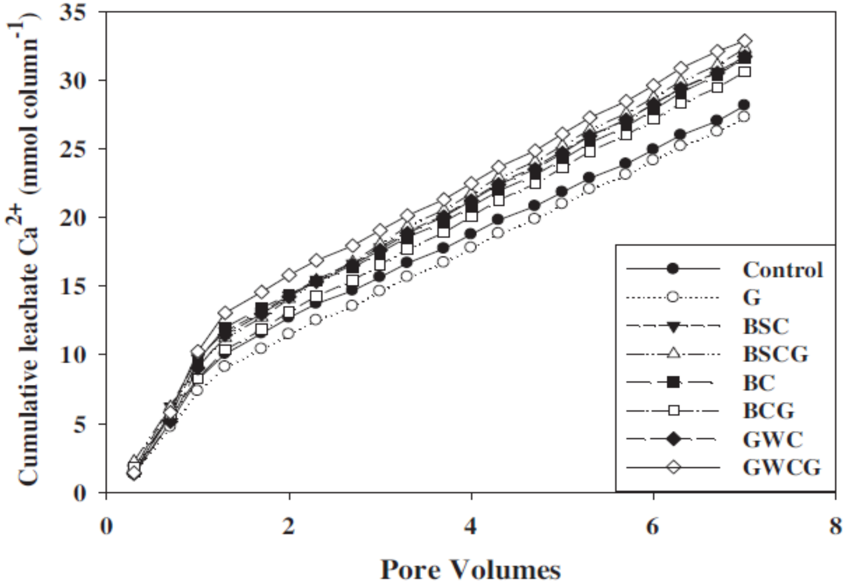
Reclamation of Saline-Sodic Soils with Composts and Biochar- Objectives

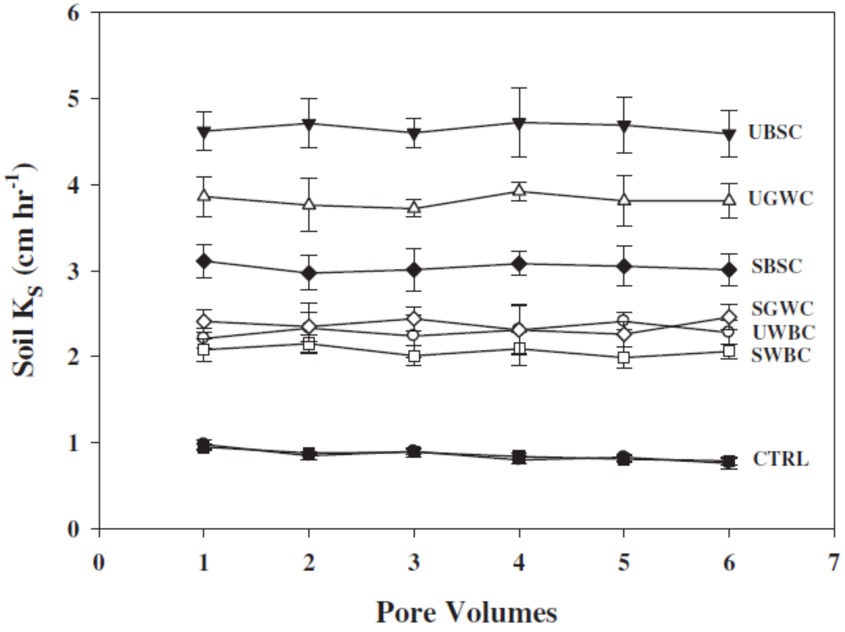
- To evaluate the effect of composts and biochar on soil physical and chemical properties, when applied alone or in combination with gypsum.

- To understand the physiochemical and biological mechanisms by which composts and biochar reclaim a saline-sodic soil.


Cumulative leachate Na+ (mmol column-1)
Pore Volumes
0
10
20
30
40
50
60
0
2
4
6
8
Control
G
BSC
BSCG
BC
BCG
GWC
GWCG


Wet Aggregate Stability (%)
Initial
After Incubation
Post leaching
0
10
20
30
40
50
60
USC
UWBC
UBSC
UGWC
SC
SWBC
SBSC
SGWC
a
b
c


Cumulative leachate Ca2+ (mmol column-1)
Pore Volumes
0
5
10
15
20
25
30
35
0
2
4
6
8
Control
G
BSC
BSCG
BC
BCG
GWC
GWCG


Soil KS (cm hr-1)
Pore Volumes
0
1
2
3
4
5
6
7
UBSC
UGWC
SBSC
SGWC
UWBC
SWBC
CTRL

Reclamation of saline-sodic soils with organic amendments – Overarching Conclusions

- Composts and biochar can be significant sources of divalent cations like Ca^{2+} and Mg^{2+} and increase Na^{+} leaching in a salt- affected soil.
- Biological activity is key in improving soil aggregate stability and hydraulic conductivity while reclamation of chemical properties is driven by material chemistry.
- Reclamation by biochar is purely physico-chemical while composts provide a better and comprehensive remediation when both physiochemical and biological factors act together.

Agricultural Water Management 158 (2015) 255–265

Contents lists available at ScienceDirect

Agricultural Water Management

journal homepage: www.elsevier.com/locate/agwat

Leaching and reclamation of a biochar and compost amended saline–sodic soil with moderate SAR reclaimed water

Vijayasatya N. Chaganti *, David M. Crohn, Jirka Šimůnek

Department of Environmental Sciences, University of California, Riverside, CA, USA

Geoderma 259–260 (2015) 45–55

Contents lists available at ScienceDirect

Geoderma

journal homepage: www.elsevier.com/locate/geoderma

Evaluating the relative contribution of physiochemical and biological factors in ameliorating a saline–sodic soil amended with composts and biochar and leached with reclaimed water

Vijayasatya N. Chaganti *, David M. Crohn

Department of Environmental Sciences, University of California, Riverside, United States

Research at Virginia Tech

Project 1: Innovation in soil carbon amendments to Virginia farms: testing the NRCS 336 conservation practice

- Farmer interactions discovered interest in biochar applications and something that can be made on site with the resources that a producer has on hand to improve the health and biology of the soil.

- A new data layer in the Web Soil Survey of the USDA describes soils across Virginia that are projected to have a “good” to “excellent” response to the application of certain biochars.

- Nationally, the NRCS has recently promulgated a new Conservation Practice Standard (336) for soil amendments, including biochar and compost, with cost-share incentives to producers.

- Interest in carbon markets and climate smart agricultural practices often include biochar as a potential land management practice, but information is often limited.

NRCS conservation practice standard 336

USDA

United States Department of Agriculture

336-CPS-1

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

SOIL CARBON AMENDMENT

CODE 336

(ac)

DEFINITION

Application of carbon-based amendments derived from plant materials 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 areas of Crop, Pasture, Range, Forest, Associated Agriculture Lands, Developed Land, and Farmstead where organic carbon amendment applications will improve soil conditions.

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.

Follow Land Grant University (LGU) or industry guidance to collect, prepare, store and ship soil samples. Ensure sampling protocol and laboratory soil test methods are the same as those required by the State-adapted NRCS Conservation Practice Standard (CPS) Nutrient Management (Code 590).

Compost

Use compost that is produced by the controlled aerobic, biological decomposition of biodegradable feedstocks. Use compost with the US Composting Council's Seal of Testing Assurance Program (STA) or that meets the following criteria in Table 2 below as determined by the Test Methods for the Examination of Composting and Compost (TMECC) or by LGU recognized methods.

Document:

- Origin of compost.
- Parameters for All Carbon Amendments in table 1.

Biochar

Use biochar that is produced by heating biomass to a temperature in excess of 350 °C under conditions of controlled and limited oxygen concentrations to prevent combustion (i.e., pyrolysis or gasification). Use biochar with the International Biochar Initiative (IBI) Certified biochar seal or that meets the criteria in table 3 as determined by the methods in IBI Standards (version 2.1), or by LGU recognized methods.

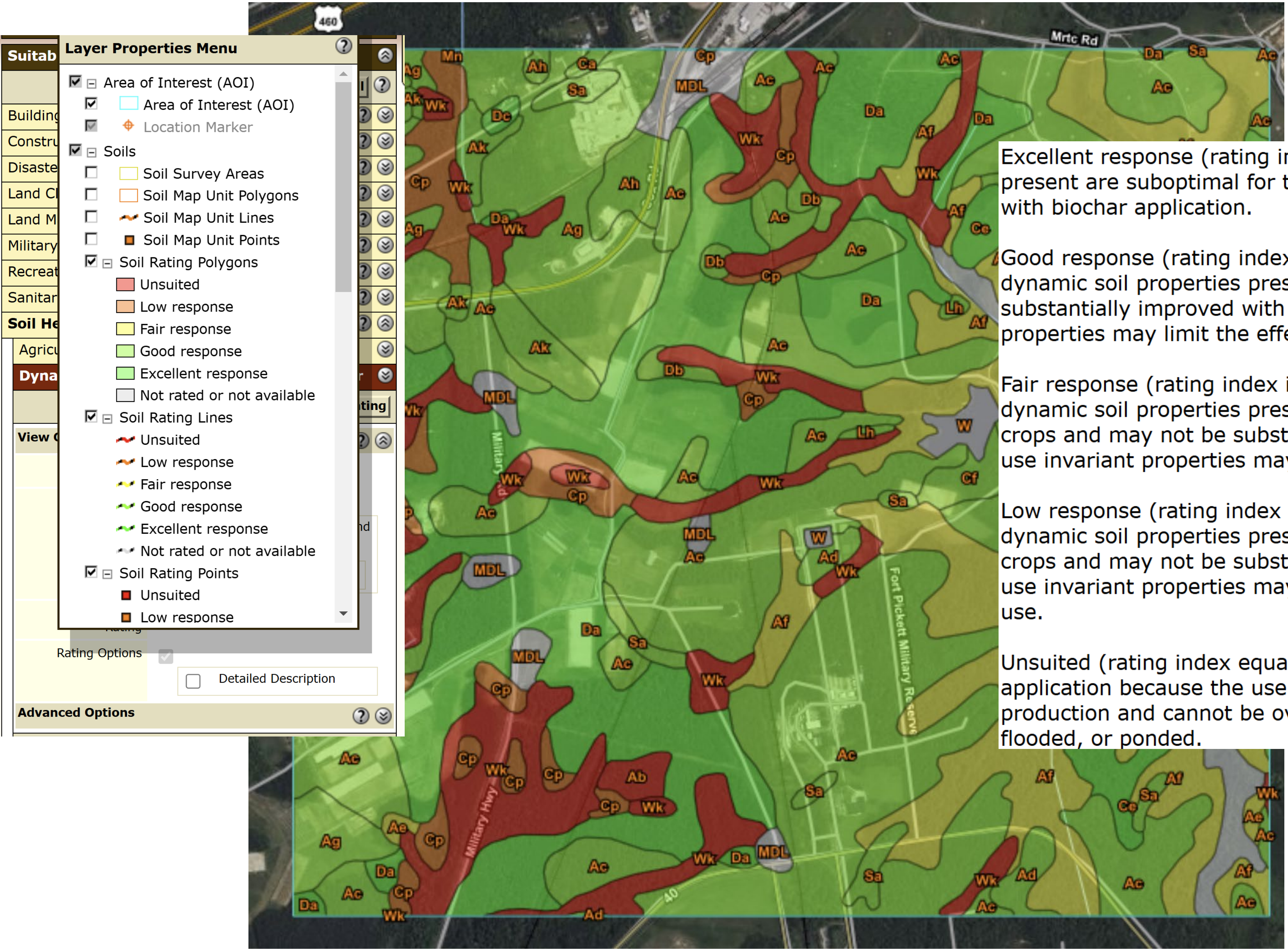
Document:

- Origin of biochar and production method (e.g., verification of temperature and limited oxygen conditions).
- Parameters for All Carbon Amendments in table 1.
- Parameters for Biochar Amendments in table 3.

Table 3. Parameters for Biochar Amendments

Parameter	Range	Unit
Total Ash	Report[1]	% of total mass, dry basis
Liming equivalent	Report	% $CaCO_3$
Organic Carbon (C_{org})	>10	% DW
$H:C_{org}$	<0.7	Molar ratio
Chromium	<1200	mg per kg DW

Navigating the Web soil survey: dynamic soil properties to biochar



Excellent response (rating index equals 1.0) One or more dynamic soil properties present are suboptimal for the growth of crops and may be substantially improved with biochar application.

Good response (rating index is greater than 0.75 but less than 1.0) One or more dynamic soil properties present are suboptimal for the growth of crops and may be substantially improved with biochar application. One or more use invariant properties may limit the effectiveness of biochar.

Fair response (rating index is greater than 0.25 but less than 0.75) One or more dynamic soil properties present may already be nearly optimal for the growth of crops and may not be substantially improved with biochar application. One or more use invariant properties may limit the effectiveness of biochar.

Low response (rating index is greater than 0 but less than 0.25). One or more dynamic soil properties present may already be nearly optimal for the growth of crops and may not be substantially improved with biochar application. One or more use invariant properties may limit the effectiveness of biochar, but not preclude its use.

Unsuited (rating index equals 0). The soil is rendered unsuitable for biochar application because the use invariant soil and site properties are limiting to crop production and cannot be overcome. The site may be too steeply sloping, too wet, flooded, or ponded.

Project 1: Innovation in soil carbon amendments to Virginia farms: testing the NRCS 336 conservation practice

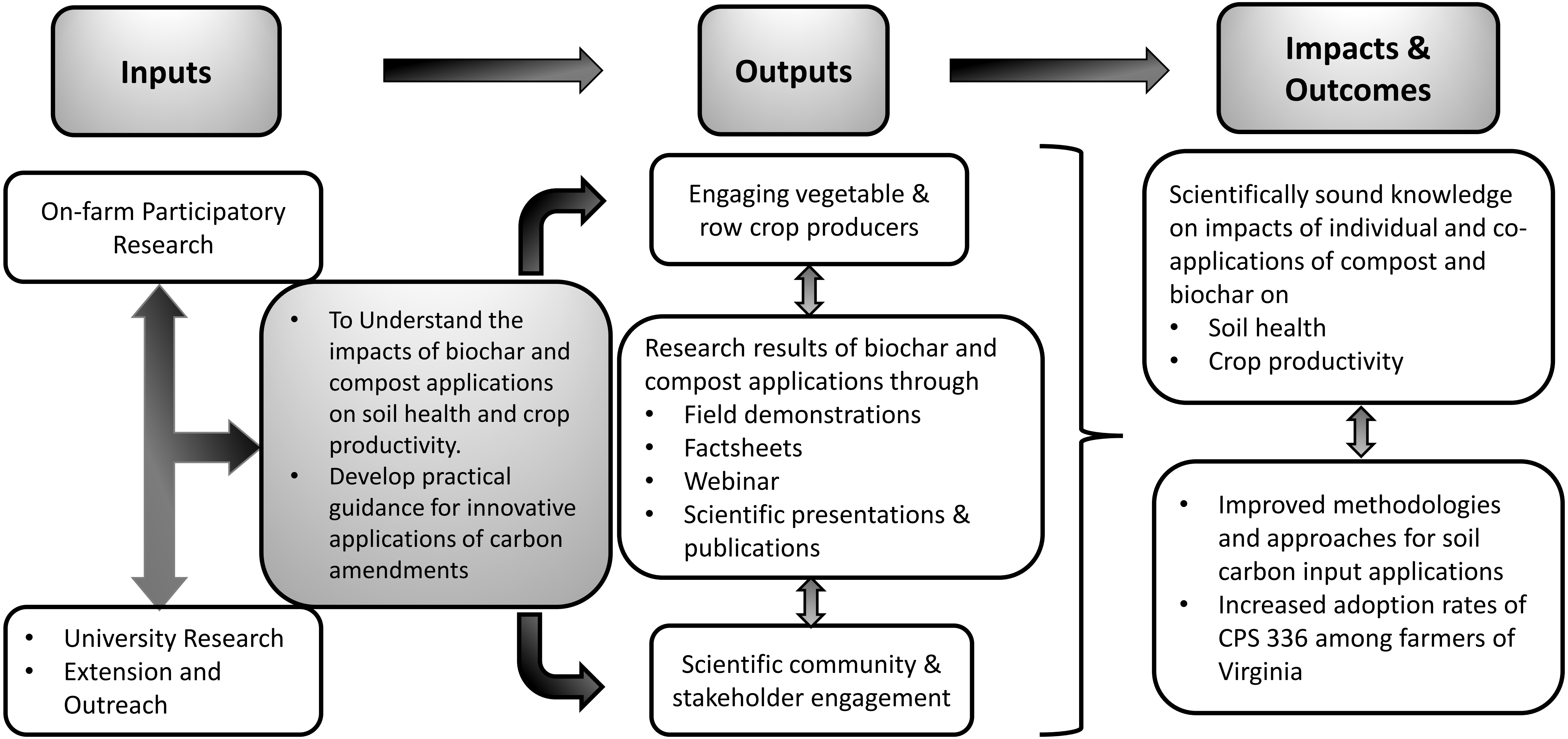
- **UNKNOWNS about biochar?**

- Biochar availability?
- Types of Biochar?
- Biochar cost of application, is it feasible?
- Biochar works on all soils?
- Application rates?
- Application techniques
- Effects of compost + biochar combined applications on soil health?

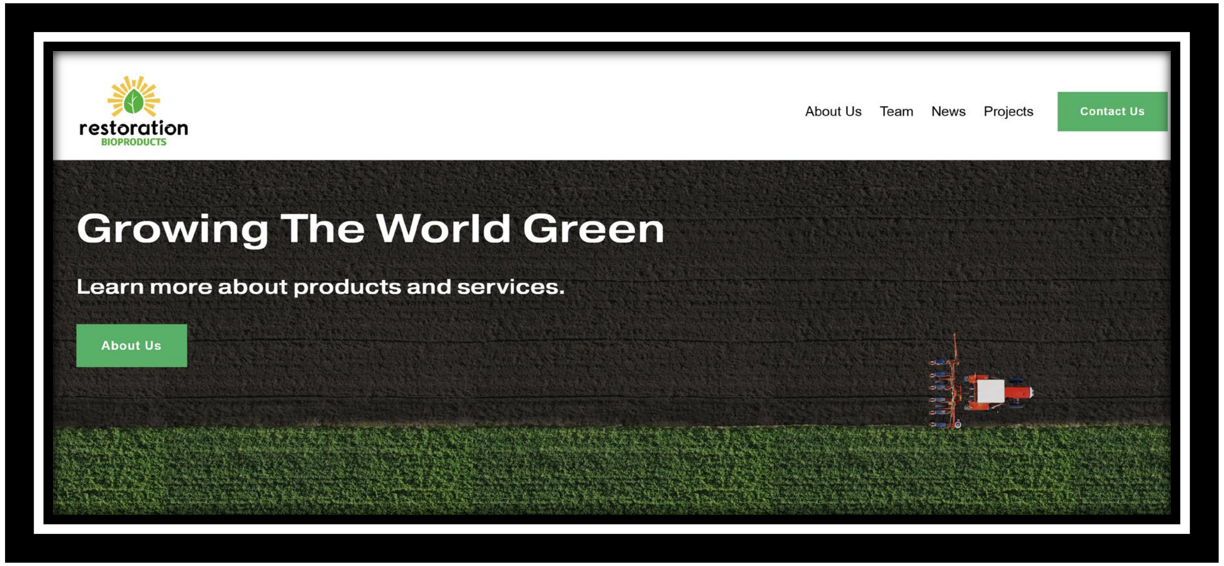
Project 1: Innovation in soil carbon amendments to Virginia farms: testing the NRCS 336 conservation practice

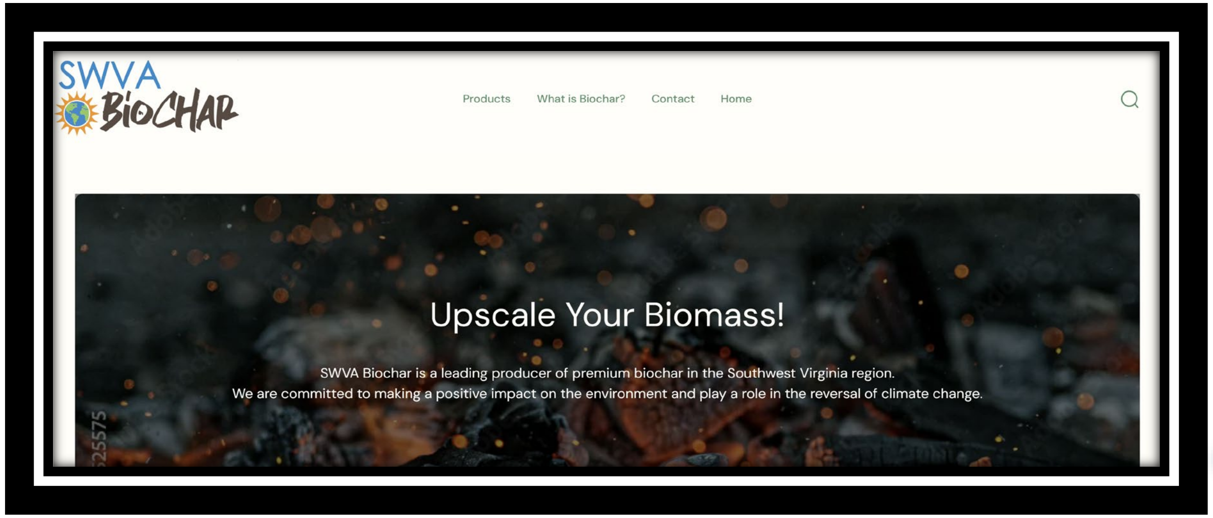
- ***An integrated research-extension effort that will fill the critical gaps in understanding the systemic implications of biochar and compost applications to Virginia soils.***

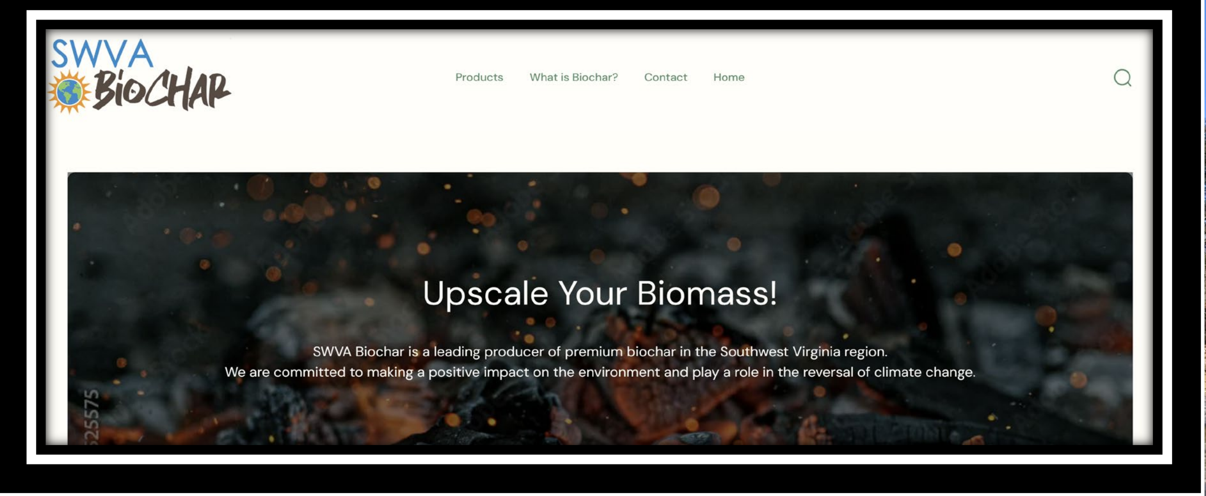
- Evaluate the availability and characteristics of biochar available to producers in Virginia.
- Improve understanding of the technical and production aspects (feedstock types, pyrolysis conditions etc.) of biochar that influence its value to farmers in the Commonwealth of Virginia.
- Test the efficacy of the recommended biochar application rate as specified by NRCS Conservation Practice 336 for standard types of biochar over a range of participating Virginia vegetable farms and row crop demonstrations.
- Examine the effects of feedstocks of biochar and compost co-applications on soil health metrics in multiple distinct soil types from across the Commonwealth.
- In meeting these objectives, we will determine what we need to learn to make site-specific recommendations to producers about soil carbon amendments.


Inputs
Outputs
Impacts & Outcomes
On-farm Participatory Research
University Research
Extension and Outreach
To Understand the impacts of biochar and compost applications on soil health and crop productivity.
Develop practical guidance for innovative applications of carbon amendments
Engaging vegetable & row crop producers
Research results of biochar and compost applications through
Field demonstrations
Factsheets
Webinar
Scientific presentations & publications
Scientific community & stakeholder engagement
Scientifically sound knowledge on impacts of individual and co-applications of compost and biochar on
Soil health
Crop productivity
Improved methodologies and approaches for soil carbon input applications
Increased adoption rates of CPS 336 among farmers of Virginia

Commercial biochar producers in the region



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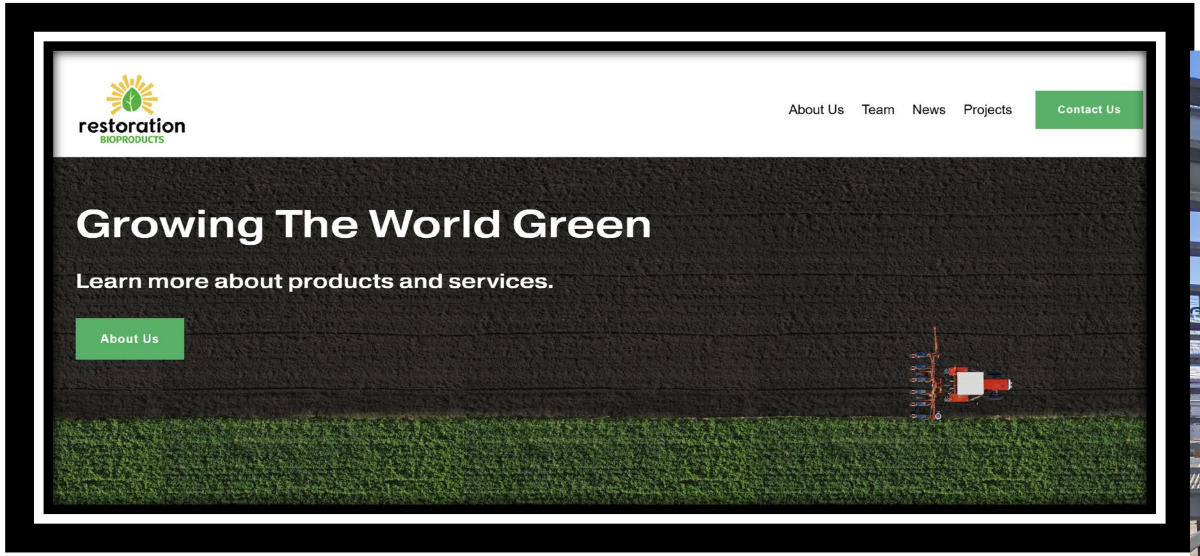
SWVA Biochar is a leading producer of premium biochar in the Southwest Virginia region.
We are committed to making a positive impact on the environment and play a role in the reversal of climate change.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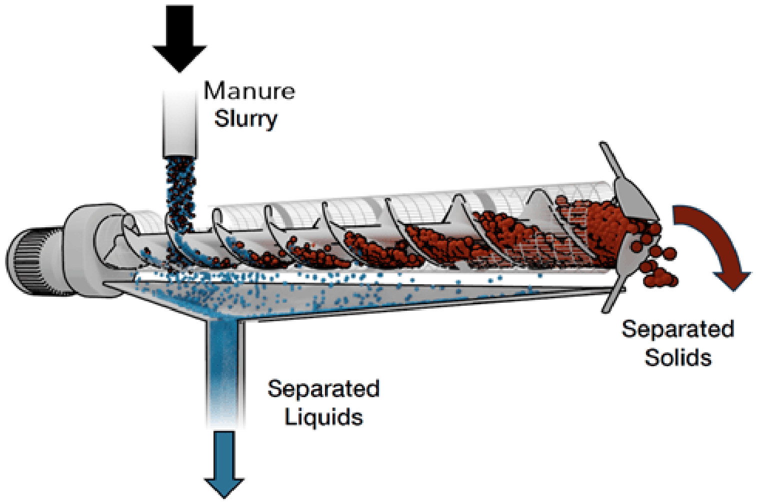
Project 2: Evaluating GHG potential of Dairy Manure Solids (DMS) and Biochar Applications



- DMS high in labile nutrients (C, N & P)
  - ↑ environmental losses
- Biochar: High Adsorption capacity
  - ↓ environmental losses

Objectives:

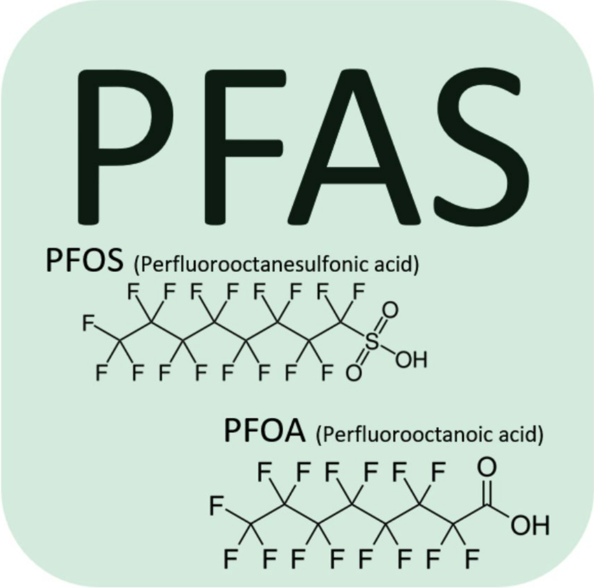
- Effects of DMS + biochar on soil health
  - Uncomposted vs. composted
  - Individual vs. conjunctive applications
- Quantifying GHG emissions from DMS + Biochar applications
  - Uncomposted vs. composted
  - Individual vs. conjunctive applications


Project 3: Evaluating EQ biosolids & biochar Applications on soil health and PFAS dynamics

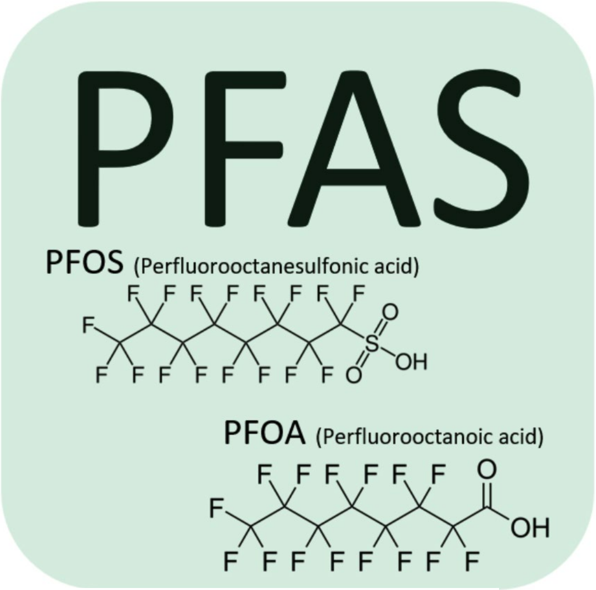
- EQ biosolids: Fertilizer substitute
- EQ biosolids and biochar: ↑ soil health
- Biochar: High Adsorption capacity
  - ↓ PFAS availability?
  - ↓ Plant uptake

Objectives:

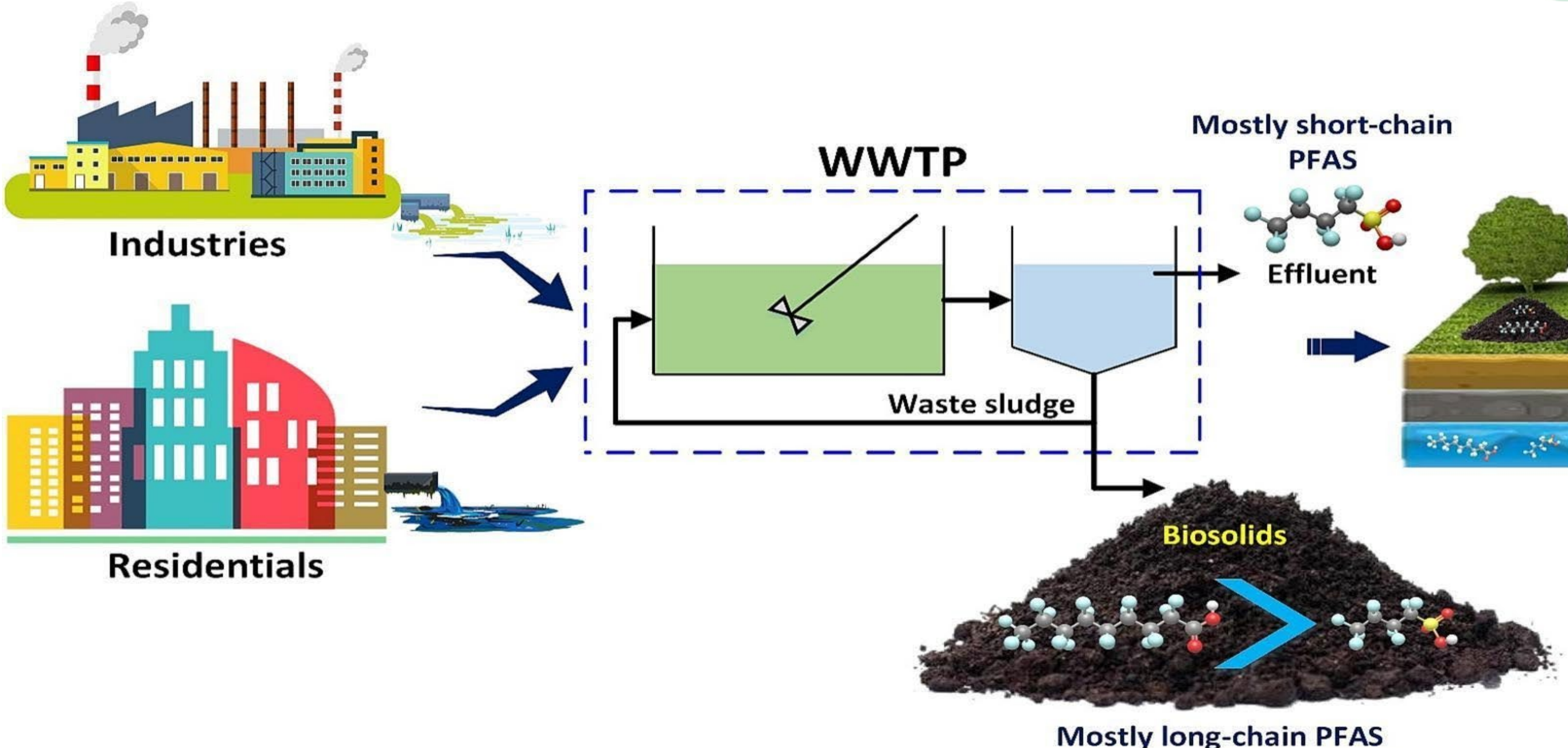
- EQ biosolids + biochar on soil health
  - Individual vs. conjunctive applications
- Quantifying PFAS dynamics in soil and water
  - Individual vs. conjunctive applications



Future Research Ideas

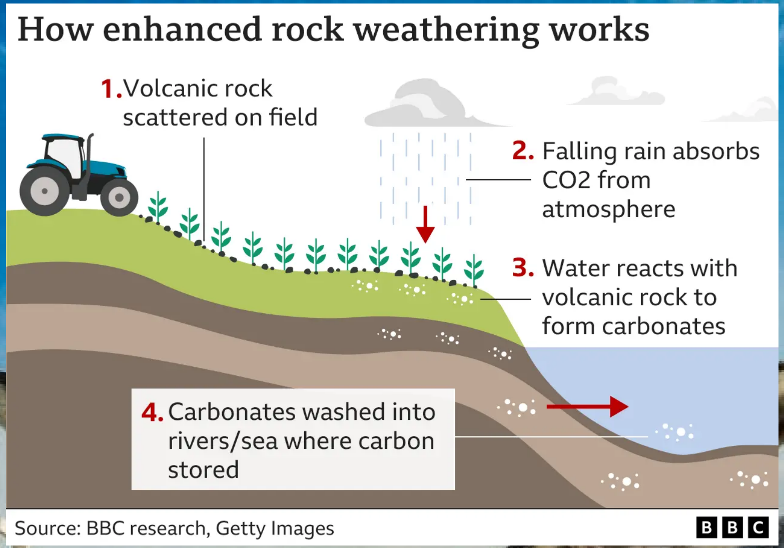


- PFAS management in biosolids:
    - Composting vs. pyrolysis alter PFAS chemically ?



Future Research Ideas

- Enhanced Rock Weathering
  - Rock dust: Byproduct of aggregate industry
  - Potential for C sequestration
    - Rockdust + compost + biochar: ↑ **C sequestration potential?**



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Thank you