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Environmental and  
Energy Study Institute

**Materials will be available at:**  
[www.eesi.org/051023farmbill](http://www.eesi.org/051023farmbill)

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# Climate, Energy, and Economic Win-Wins in the Farm Bill

Wednesday, May 10, 2023

# About EESI



## **Non-partisan Educational Resources for Policymakers**

A bipartisan Congressional caucus founded EESI in 1984 to provide non-partisan information on environmental, energy, and climate policies

## **Direct Assistance for Equitable and Inclusive Financing Program**

In addition to a full portfolio of federal policy work, EESI provides direct assistance to utilities to develop “on-bill financing” programs

## **Commitment to Diversity, Equity, Inclusion, and Justice**

We recognize that systemic barriers impede fair environmental, energy, and climate policies and limit the full participation of Black, Indigenous, people of color, and legacy and frontline communities in decision-making

## **Sustainable Solutions**

*Our mission is to advance science-based solutions for climate change, energy, and environmental challenges in order to achieve our vision of a sustainable, resilient, and equitable world.*

# Polycymaker Education

## Briefings and Webcasts



Live, in-person and online public briefings, archived webcasts, and written summaries

## Climate Change Solutions



Bi-weekly newsletter with everything policymakers and concerned citizens need to know, including a legislation and hearings tracker

## Fact Sheets and Issue Briefs



Timely, objective coverage of environmental, clean energy, and climate change topics

## Social Media (@EESIOnline)



Active engagement on Twitter, Facebook, LinkedIn, and YouTube



# EESI Farm Bill Resources



**Briefing Notice**  
Agriculture and Climate Series

The climate crisis and years of unsustainable farming in the United States have resulted in soil erosion, pollinator loss, farmworkers and livestock exposed to extreme heat, and other harmful impacts. In 2019, 20 percent of U.S. greenhouse gas emissions came from agriculture. At the same time, farmers and the land they work are vulnerable to climate impacts such as drought and extreme weather. EESI's Agriculture and Climate series covers five sustainable agricultural practices: cover crops, agroforestry, no-till farming, sustainable livestock grazing, and soil conservation.

**Congressional Hearings Leading up to the 2023 Farm Bill**  
By [S. Chase Parker](#) and [Savannah Burkhard](#)  
April 18, 2022

Over the course of the next year or so, the 2023 Farm Bill will take shape on Capitol Hill. Roughly every few years, Congress convenes to hold hearings to discuss the current Farm Bill and to develop a new one. This article provides an environmental angle periodically updated.

**Key Changes**

- This resource will be updated as the House and Senate legislative Farm Bill texts are released.

Legislative Side-By-Side		
Current Law <i>Public Law 117-163 (October 2022)</i>	House Version	Senate Version
<p><b>§6 Purpose</b> The purpose of this section is to help local families and small businesses achieve cost savings by granting loans to qualified consumers for equipment durable and effective energy efficiency measures.</p> <p><b>§6 Definitions</b> In this section: (A) "eligible entity" means— (i) any publicly owned electric utility district, or similar entity, or any electric cooperative described in section 100(a)(2) or (3)(B)(i) of title 16, that borrowed and repaid, applied for, or is paying an electric loan made or guaranteed by the Rural Utilities Service (or any predecessor agency); (ii) any entity primarily owned or controlled by 1 or more entities described in subsection (A); or (iii) any other entity that is a eligible borrower of the Rural Utilities Service, as determined under section 1716(B) of title 7, Code of Federal Regulations (or any predecessor regulation); (B) "energy efficiency measure" means— (i) the term "energy efficiency measure" means, for an equipment used by an eligible entity, structural improvements and treatments to use efficient, commercial technologies to increase energy</p>	<p>This resource will be updated as the House legislative Farm Bill text is released.</p>	<p>This resource will be updated as the Senate legislative Farm Bill text is released.</p>

- Congressional briefings
- Articles and podcasts
- *Climate Change Solutions* newsletter special editions
- Farm Bill hearing tracker
- Legislative side-by-side-by-sides

All resources available at: [www.eesi.org/2023-farm-bill](http://www.eesi.org/2023-farm-bill)

# Briefing Series: Farm Bill in Focus



**EESI**  
Environmental and  
Energy Study Institute

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**Every Other Wednesday**

**The Process and Path Forward for Passing a Bipartisan Farm Bill | Recording Available**

**Climate, Energy, and Economic Win-Wins in the Farm Bill | May 10, 1:30-3:00 PM EDT**

**Unlocking Rural Economies: Farm Bill Investments in Rural America | May 24, 2:00-3:30 PM EDT**

**The Future of Forestry in the Farm Bill | June 07, 2:00-3:30 PM EDT**

**Conservation Practices from Farms to Forests and Wetlands | June 21, 2:00-3:30 PM EDT**

# GAO's Work on Climate Resilient Agriculture

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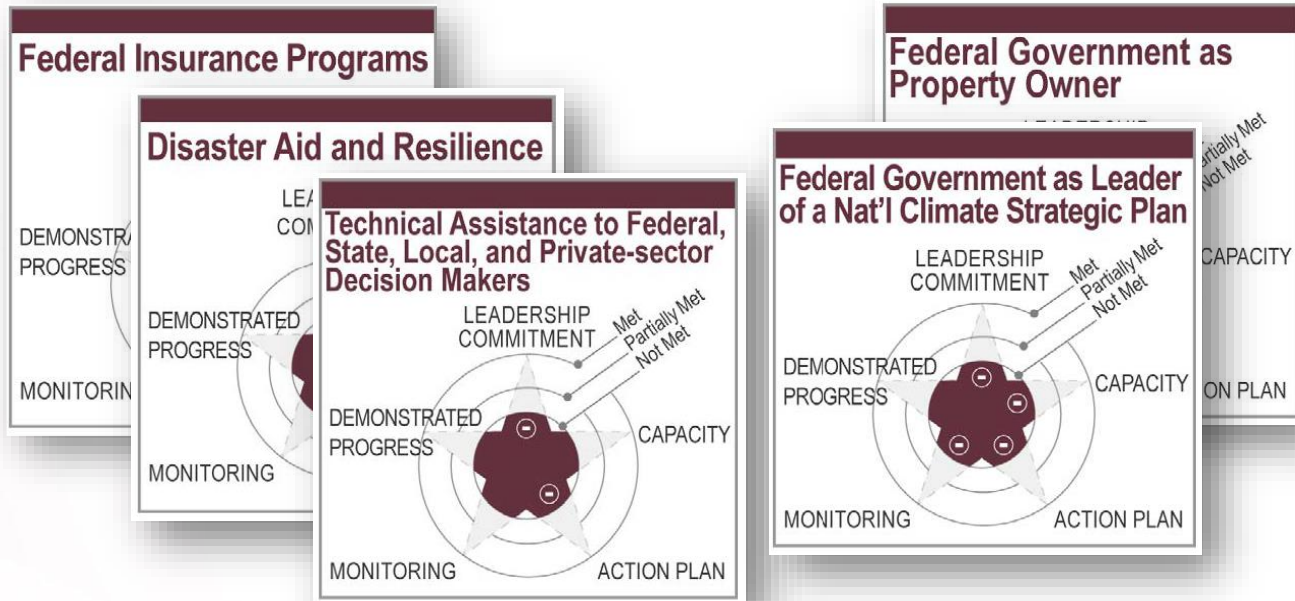
EESI

Micah McMillan and Joe Thompson  
Natural Resources and Environment Team  
U.S. Government Accountability Office

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# GAO's High Risk Series: Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks



High-Risk Series: Efforts Made to Achieve Progress Need to Be Maintained and Expanded to Fully Address All Areas (GAO-23-106203)

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## Two Categories of Recommendations

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### Agency Mainstreaming

- Water systems
- Roads and bridges
- Defense facilities
- Energy infrastructure
- Superfund sites
- Agriculture

### New Institutions

- National Climate Information System
- Identify high-priority adaptation projects
- Address climate migration

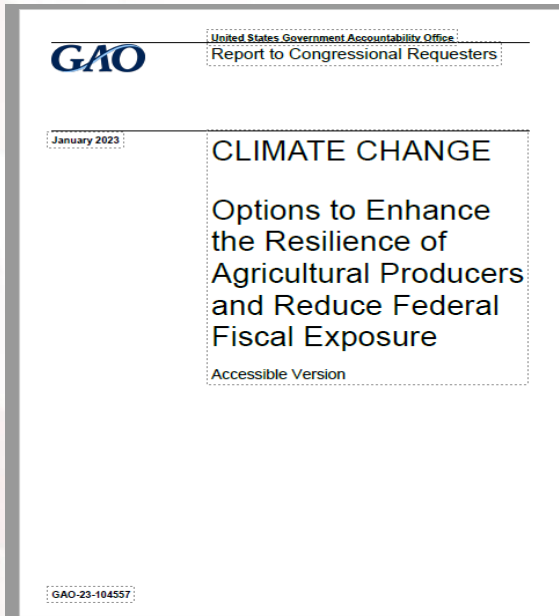


# Disaster Resilience Framework



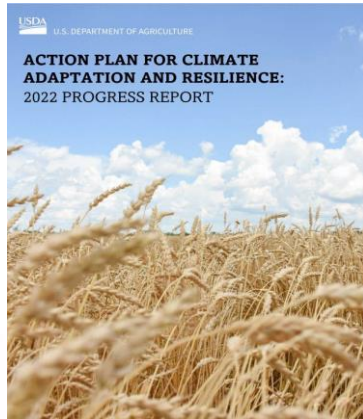
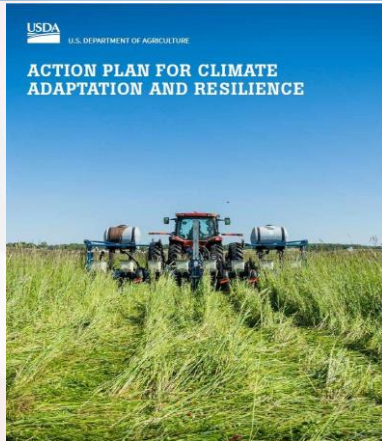
- Framework organized around 3 principles—information, integration, and incentives—and a series of questions.
- Framework principles can help:
  - Officials that manage federal agencies/programs consider actions they might take to increase resilience to natural hazards.
  - Analyze or identify gaps in existing federal efforts.

# Climate Resilient Agriculture: USDA Actions



- **Federal fiscal exposure:**
  - Crop insurance program.
  - Agricultural disaster relief programs.
- **Objectives:**
  - Actions USDA has taken to enhance producer resilience.
  - Policy options available to USDA to enhance producer resilience.
- **Methodology:**
  - Literature review.
  - Interviews with experts and key stakeholders

# Climate Resilient Agriculture: USDA Actions



- **Information**
  - Climate Hubs regional vulnerability assessments.
- **Integration**
  - *Action Plan for Climate Adaptation and Resilience*
  - 13 agency level adaptation plans
- **Indirect Incentives**
  - Conservation programs.
  - Inflation Reduction Act of 2022.

## Climate Resilient Agriculture: Potential Options

1. Collect data on practices that enhance climate resilience.
2. Expand technical assistance to prioritize and promote climate resilience.
3. Prioritize climate resilience in whole-farm conservation planning.
4. Expand the capacity and expertise of USDA's Climate Hubs.
5. Develop an agricultural climate resilience plan that addresses regional needs.
6. Establish standards for climate-resilient agricultural operations.
7. Revise the Natural Resources Conservation Service's Conservation Practice Standards to include climate resilience.
8. Expand conservation program eligibility to include and prioritize climate resilience.
9. Expand the capacity of USDA's conservation programs.
10. Research the feasibility of incorporating climate resilience into crop insurance rating.
11. Require producer adoption of climate-resilient practices to receive crop insurance premium subsidies.
12. Offer crop insurance premium subsidies for climate-resilient operations.
13. Require producer adoption of climate-resilient practices to maintain Farm Bill Title I program eligibility.

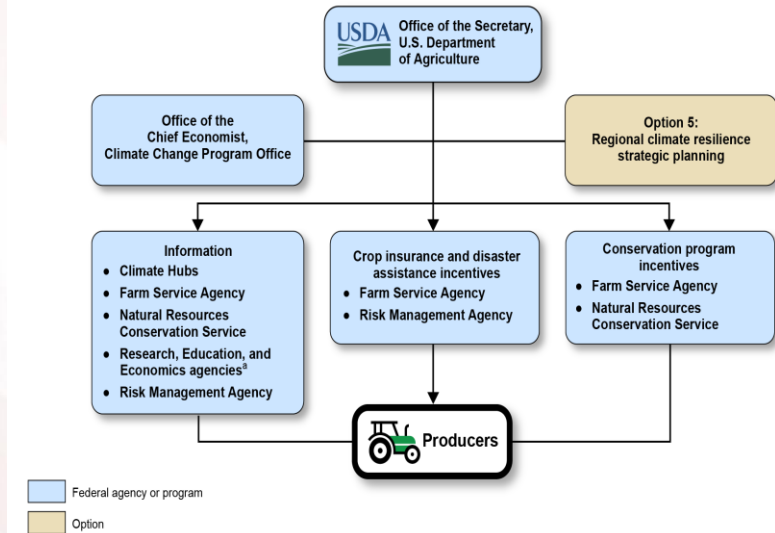
## Climate Resilient Agriculture: Potential Options



Source: USDA

- Implementing multiple options:
  - Most potential to improve producer resilience
  - Leverages strengths and addresses limitations.
  - Timing and sequence are important.
- USDA unsure of statutory authority and resource needs for implementation.
- Comprehensive analysis would help:
  - Identify planning priorities
  - Inform Congressional decisionmaking.

# Climate Resilient Agriculture



Source: GAO analysis of information provided by U.S. Department of Agriculture. | GAO-23-104557

## We recommended:

USDA should analyze options to enhance the climate resilience of agricultural producers and integrate them into USDA's future climate resilience prioritization and planning efforts. The analysis should:

- Explain USDA's decision to prioritize or not prioritize the options.
- Identify any additional authority and resources needed for implementation.

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## GAO on the Web

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## Congressional Relations

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(202) 512-4400, U.S. Government Accountability Office  
441 G Street, NW, Room 7125, Washington, DC 20548

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# Agroforestry

**Resilient Working Lands for Climate, Water, Biodiversity & Food Security**

**Audrey Epp Schmidt**

*Agroforestry Program Manager, North America*



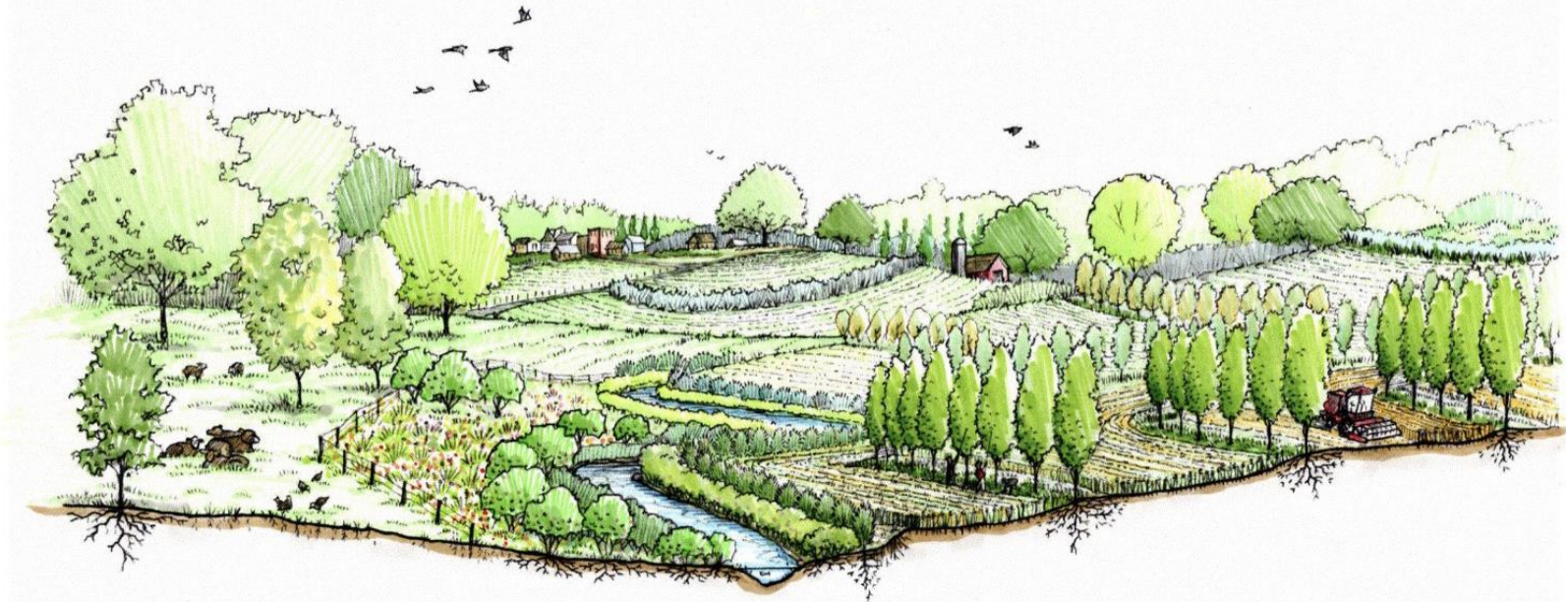


# Our Vision

A world where the diversity of life thrives, and people act to conserve nature for its own sake, and its ability to fulfill our needs and enrich our lives.

# What Is Agroforestry?

The intentional integration of trees and shrubs into crops and animal farming systems to create environmental, economic, and social benefits.



# Agroforestry Practices

Alley Cropping



Wind Breaks



Silvopasture



Riparian Buffers

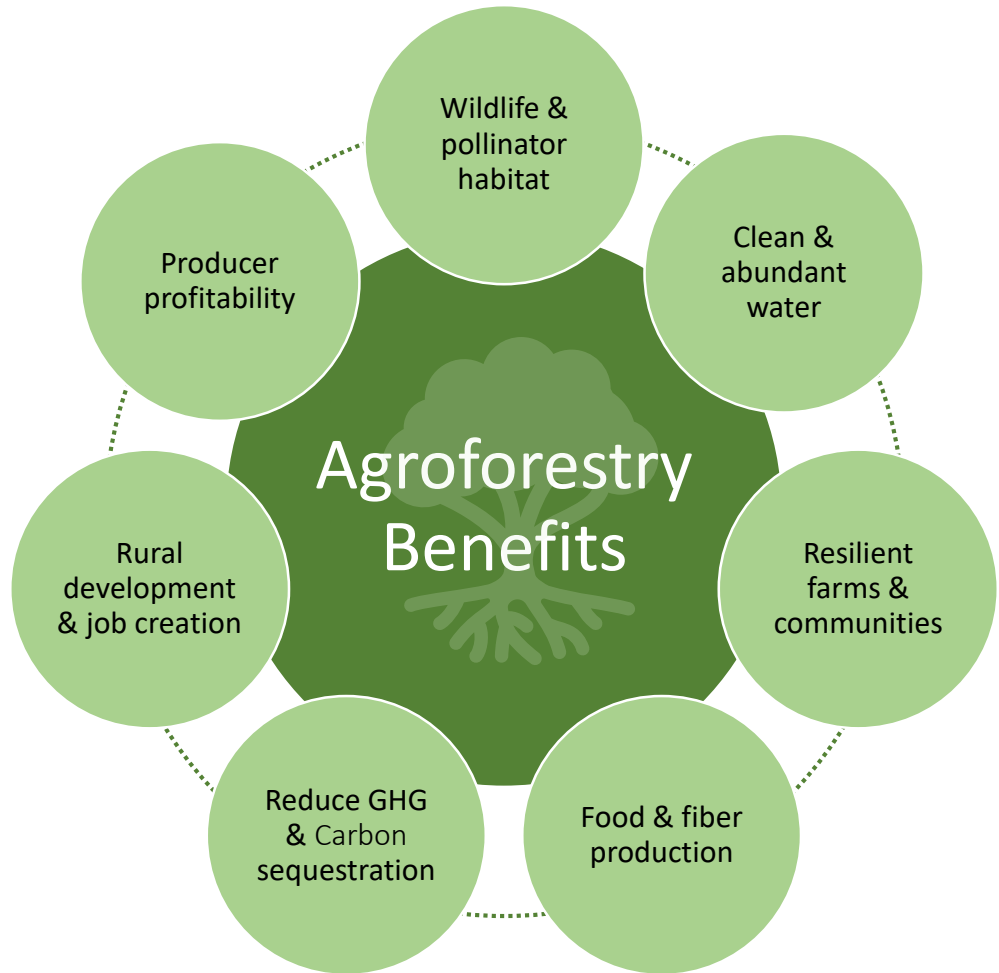


Forest Farming



# Why Agroforestry?

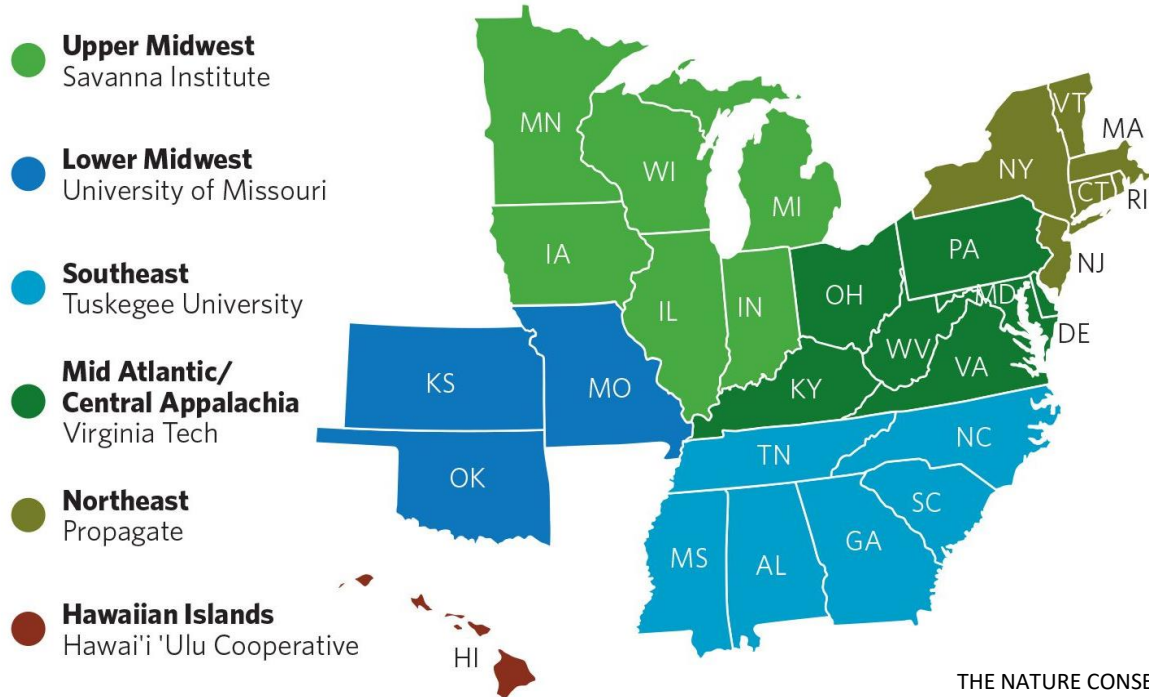
Widespread adoption of agroforestry practices will benefit climate and nature and support the well-being of farmers, ranchers and communities.



# Partnerships for Climate-Smart Commodities Grant

*Expanding Agroforestry Production & Markets for Producer Profitability & Climate Stabilization*

**\$60M • 5 Years • 29 States • 27 Partners**







## Audrey Epp Schmidt

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Agroforestry Program Manager, North America

[a.eppschmidt@tnc.org](mailto:a.eppschmidt@tnc.org)

HOPE

CENTER



# Context

- The average income of a Blue Island resident is \$18,867 a year. The US average is \$28,555 a year.
- The average income of a Robbins resident is \$14,801 a year. The US average is \$28,555 a year.
- Food apartheid is a concern for these two predominately Black and Brown communities that are food deserts.
- Unemployment is also an obstacle, with both cities have unemployment rates close to twice the national average.



# WINGS OF HOPE

HOPE  
GARAGE

HOPE  
GARDEN

HOPE  
CENTER

HOPE  
TECHNOLOGY

HOPE  
MEDIA

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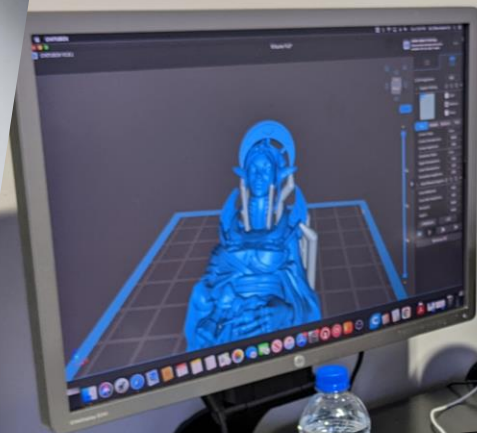
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HOPE  
CENTER



# Hope Garage



Hope Tech





TRAIN TRACKS



PUBLIC ALLEY

PARKING LOT

NEIGHBORING BACKYARDS

TRAIN TRACKS

1:18

1:18

















**Saving/ Budgeting**

**Why is it important to budget?**

- Help you control your spending
- Meet your expenses
- Avoid being in debt
- Budgeting can help you make better financial decisions
- Prepare for emergencies - like illness
- Get out of debt - or avoid it all together
- Help you stay focused on your long-term financial goals
- Plan and track making each week - to evaluate your life, your mortgage/rent payments, etc.
- No matter how tight your budget is, you can still enjoy your life, your family, your friends, and your future.







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# Agriculture, Solar, and the AgriSolar Clearinghouse: A Win-Win for the Farm Bill

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STACIE PETERSON, PHD, NATIONAL CENTER FOR APPROPRIATE TECHNOLOGY  
ENERGY PROGRAM DIRECTOR

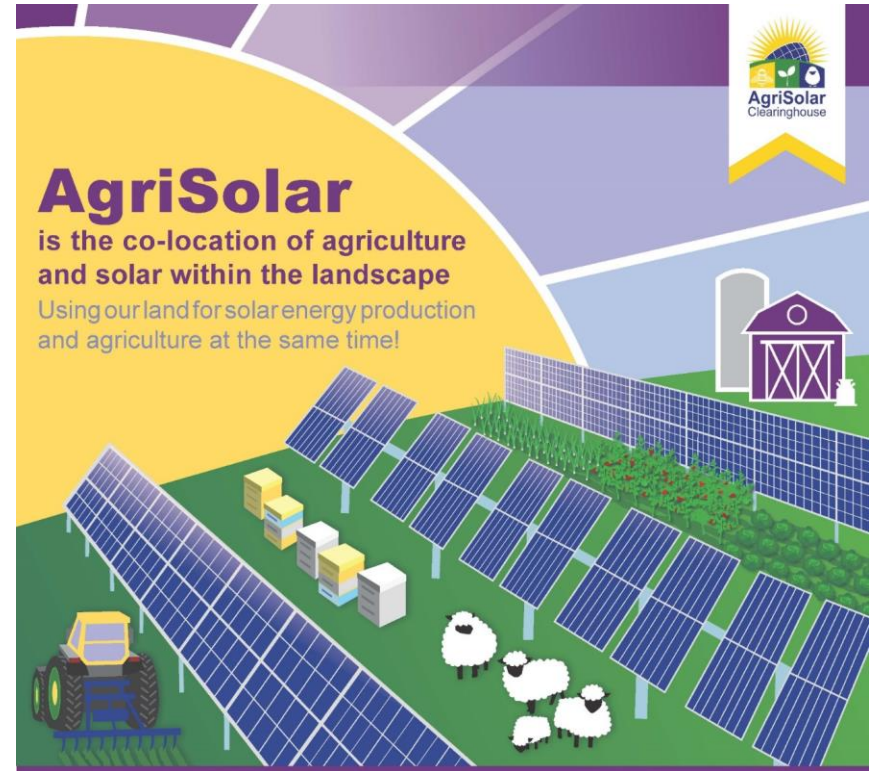
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# What is Agrisolar?

- Agrisolar is the co-location of agriculture and solar within the landscape.
- Solar developments will cover over 3 million acres in 10 years.
  - If these lands become energy-only production it will impact farms, habitat, soil health, and communities.
- There is tremendous opportunity for low-impact solar development that is complementary with sustainable agriculture, known as Agrisolar.
- It includes solar co-located with crops, grazing, beekeeping, pollinator habitat, aquaculture, dairies, and crop processing.
- In addition to photovoltaics, it also includes concentrated solar.
- Other terms include: agrivoltaics, dual-use, co-location, agri-pv



# With Agrisolar, You Harvest the Sun Twice.



- Once with the solar panel and again with crops, forage, honey, and habitat.
- It can help you get the most productivity out of your land, while also supporting the crops, community, and ecosystem around it.
- When designed and managed with best practices, AgriSolar can:
  - Diversify farm revenue,
  - Increase rural energy independence,
  - Decrease crop irrigation by half in heat-stressed areas,
  - Increase solar panel efficiency,
  - Promote grazing as vegetation management,
  - Increase soil organic matter and carbon accrual,
  - Improve ecosystem health and support native species,
  - Triple local pollinators like bees, butterflies, birds, and bats.



# Federal Program That Support AgriSolar

- ▶ U.S. Department of Energy Solar Energy Technology's Office:
  - AgriSolar Clearinghouse
  - Innovative Solar Practices Integrated with Rural Economies and Ecosystems (InSPIRE)
  - Foundational Agrivoltaic Research for Megawatt Scale (FARMS) projects
- ▶ USDA Partnerships for Climate-Smart Commodities
  - University of Texas Rio Grande Valley: Validating Agrivoltaic Technology with Underserved Agricultural Producers (NCAT/AgriSolar Clearinghouse is a partner)
  - University of Arizona Climate Smart Food
  - Low Carbon Beef
- ▶ REAP
- ▶ Hopefully more soon!



# Welcome to the AgriSolar Clearinghouse



An NCAT-developed, U.S. Department of Energy -funded relationship-building, information-sharing network.  
Funding ends May 2024



# AgriSolar Clearinghouse Features

- Information Library
- Original Media
  - Best practices
  - Short film series
  - Technical assistance pieces
  - Fact sheets
  - Case studies and atlas
  - Financial assistance state-by-state map
  - Podcast serial
- Media Hub
- Individualized Technical Assistance
- Education
  - Webinars
  - Self-paced tutorials
  - In-person and virtual presentations
- User Forum
- Events
- Field Trips and Farm to Table Events



## AGRSOLAR CLEARINGHOUSE WEBINAR SERIES

**REGISTER TODAY  
BY CLICKING ON THE DATES!**

All Webinars will occur at 11am MST via Zoom

**January 18, 2023**  
Crunching Numbers on Agrivoltaics: Context and Costs of Agrivoltaics in the United States. Jordan Macknick and James McCall from National Renewable Energy Laboratory.

**February 7, 2023**  
Made in the Shade: Growing Crops under Solar Panels, Greg Barron-Gafford Group.

**February 21, 2023**  
Ecosystem Services of Solar-Pollinator Habitat. Lee Walston, Argonne National Laboratory

**March 23, 2023**  
Innovative AgriSolar Design - A Roundtable with Helical Solar, Bozeman Greenbuild, Solculture, Sun Agri, Hyperion, Sandbox Solar, Solargik, and RUTE Agrivoltaics

**April 4, 2023**  
Exploring the Food, Energy, Water Nexus: Characterizing the Agroecological Impacts of Utility-scale Solar Energy in the Arid West. Dr. Seeta Sistla and Amanda Gersoff, Cal Poly

**April 20, 2023**  
Policy Approaches for Dual-use and Agrisolar Practices. Heidi Kolbeck-Ulacher, Center for Rural Affairs.

**May 4, 2023**  
AgriSolar Ownership, Lease, and Land Planning. Carl Berntsen and Chris Lent, NCAT

**May 24, 2023**  
AgriSolar in the Pacific Northwest, Max Greene, Renewable Northwest

SCAN ME 

AGRSOLARCLEARINGHOUSE.ORG/EVENTS | AGRISOLAR@NCAT.ORG 



# Recent Publications



## Policy Approaches for Dual-Use and Agrisolar Practices

By Heidi Kolbeck-Urlacher, Center for Rural Affairs  
April 2023



CENTER for  
RURAL AFFAIRS

### CONTENTS

**Introduction**  
**Land-use and Solar**  
How Much Land Will Be Needed?  
Alternatives to Land-use Restrictions

#### Types of Dual-use

Crops  
Grazing  
Beekeeping  
Native Vegetation and Pollinator Habitat

#### Policy Approaches to Dual-use and Agrivoltaics

Federal  
State  
Local

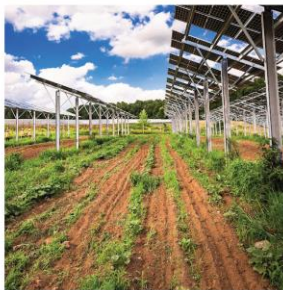
#### Considerations for Local Decision Makers: How Ordinances Can Facilitate Dual-use

Land-use Planning  
Zoning and Siting Regulations  
Definitions  
Interaction of Dual-use Goals  
Site Construction, Decommissioning, and Restoration

#### Key Take-aways

### INTRODUCTION

As demand for clean energy increases, solar deployment is expected to rise. Because utility-scale solar requires considerable land use, many state and local governments are prudently discussing the impact future solar development will have on agricultural lands. The practice of dual-use solar, which refers to allowing two uses to be accomplished in the same space, can



address concerns about solar on agricultural land.<sup>1</sup>

Agrisolar, also called agrivoltaics, is the co-location of agriculture and solar within the landscape. It includes solar co-located with crops, grazing, beekeeping, pollinator habitat, aquaculture, and farm or dairy processing. In addition to photovoltaics, it also includes concentrated solar installations.<sup>2</sup> The practice of combining agriculture and solar energy systems can provide numerous economic and environmental benefits. This includes improving economic viability for landowners and agricultural entities, providing beneficial ecological services, and expanding siting

<sup>1</sup> Marieb, Dugan. "Dual-use Solar in the Pacific Northwest: A Way Forward." Renewable Northwest, 2019. Accessed March 2023.

<sup>2</sup> Personal communication, Stacie Peterson, Energy Program Director, National Center for Appropriate Technology, March 2023.



## AGRISOLAR POLICY GUIDE



### Introduction

The AgriSolar Policy Guide was designed to facilitate policy learning and innovation in the United States. By collating existing initiatives and key provisions, this guide serves as a resource for regulators, land use planners, decision makers, and others who are interested in state of the art agrisolar policy. The AgriSolar Clearinghouse is impartial towards policy, the intention of this guide is not to advocate for certain initiatives, but to provide a central platform for education and engagement. The goal of this guide is to support policy innovation for better co-location.

The policy initiatives included in this guide were selected to feature a full suite of state-level and a sampling of county-level regulatory strategies across different types of agrisolar practices (crops, grazing, and pollinator habitat). These policy initiatives showcase a range of approaches to drive innovation in farmland solar, including market mechanisms, scoring systems, mandates, and voluntary programs.

Despite the diversity of approaches, one common goal persists across all initiatives: to promote the expansion of renewable energy in a manner that mitigates impacts to farmland. To that end,

### TABLE OF CONTENTS

- Introduction
- Existing State-Level Initiatives
- Summary of Local Land Use Code Analysis
  - Size of Solar Energy Systems
  - Solar Allowable Zoning Designations
  - Solar Specifically on Agricultural Land
- Permitting
- Height Restrictions
- Setbacks
- Noise, Dust, Glare
- Vegetation Management
- Fencing
- Vegetation Barrier / Screening
- Decommissioning
- Decommissioning Bond
- County-level AgriSolar Regulation Comparisons
  - Northeast Region
  - Southeast Region
  - Midwest Region
  - Mountain West Region
  - West Coast Region



## AgriSolar Ownership: A Guide for Farmers, Ranchers, Communities, and Landowners to Co-locate Agricultural Production and Solar Generation

By Carl Bertsens, NCAT Energy Engineer  
May 2023

### CONTENTS

Abstract  
Introduction  
Small-Scale Solar  
Medium-Scale Solar  
Utility-Scale Solar  
Financial Snapshot of Large-Scale Solar  
Development  
Conclusion  
References

### ABSTRACT

This guide serves as an introduction to the solar industry, relative to agrisolar development in the United States, community programs, and solar ownership or lease opportunities for homes, farms, and ranches. It covers ownership options for small-scale, single-user solar installations, community solar installations that distribute power throughout a community, and utility-scale installations that sell power to the utility, as well as common utility-scale land-lease components for landowners looking to allow a developer to construct and operate a solar installation on a portion of their land. Finally, using nationwide average statistics on production and cost, the guide offers a financial snapshot of a utility-scale solar installation.

### INTRODUCTION

This guide serves as an introduction to the solar industry, relative to agrisolar development in the United States, community programs, and solar



ownership or lease opportunities for homes, farms, and ranches. The guide will touch on single-user systems in the 5kW – 50kW range, medium-scale solar projects in the 50kW and larger range, and utility-scale solar sites that are larger than 1MW. Utility and community solar power generation involves complex ownership structures where the solar site, solar power generating array, and power distribution network may be owned by different entities.

From 2010 to 2020, the cost of utility-scale photovoltaic (PV) systems decreased by 82%, driven mainly by lower hardware costs, and PV module prices dropped 85% (Feldman, 2021). Solar power accounted for 0.1% of all power generated in the U.S. in 2010—increasing to nearly 5% in 2022—and for 50% of new electric capacity added to the grid (SEIA, 2022). Large- or utility-scale solar installations account for most of this increased solar generation



# Win-Win

- ▶ AgriSolar can be a win-win on the ground
- ▶ On farms
- ▶ For climate, energy, and the economy
- ▶ Agrisolar/agrivoltaics is a win-win for the Farm Bill
- ▶ The AgriSolar Clearinghouse can help



# Thank You

Environmental and Energy Study Institute (EESI)

U.S. Department of Energy Solar Energy Technologies Office

USDA

NCAT

AgriSolar Clearinghouse team, partners, and community

Contact: [agrisolar@ncat.org](mailto:agrisolar@ncat.org)

We're stronger together

A promotional graphic for AgriSolar Extra. The left side features a yellow background with a sun and field pattern. The right side shows a close-up of solar panels in a field with yellow flowers. The text is white and purple.

**AgriSolar  
Extra**

Don't miss a thing. Sign up for news and event information delivered directly to your inbox. Join the AgriSolar Extra for a bi-monthly look at the latest agrivoltaic news.

[AGRISOLARCLEARINGHOUSE.ORG](https://AGRISOLARCLEARINGHOUSE.ORG)

**SIGN UP**

The AgriSolar logo, featuring a sun rising over a field with icons for a bee, a plant, and a water drop.



# Biochar



**EESI**

Environmental and Energy  
Study Institute

Kathleen Draper  
biocharro2@gmail.com

# Agenda

- **What is Biochar?**
- **Biochar Production**
- **Biochar & Climate Change**
- **Composting & Biochar**
- **Anaerobic Digestion & Biochar**
- **Federal support**
- **Where to learn more**

# What is biochar?



# Biochar Production

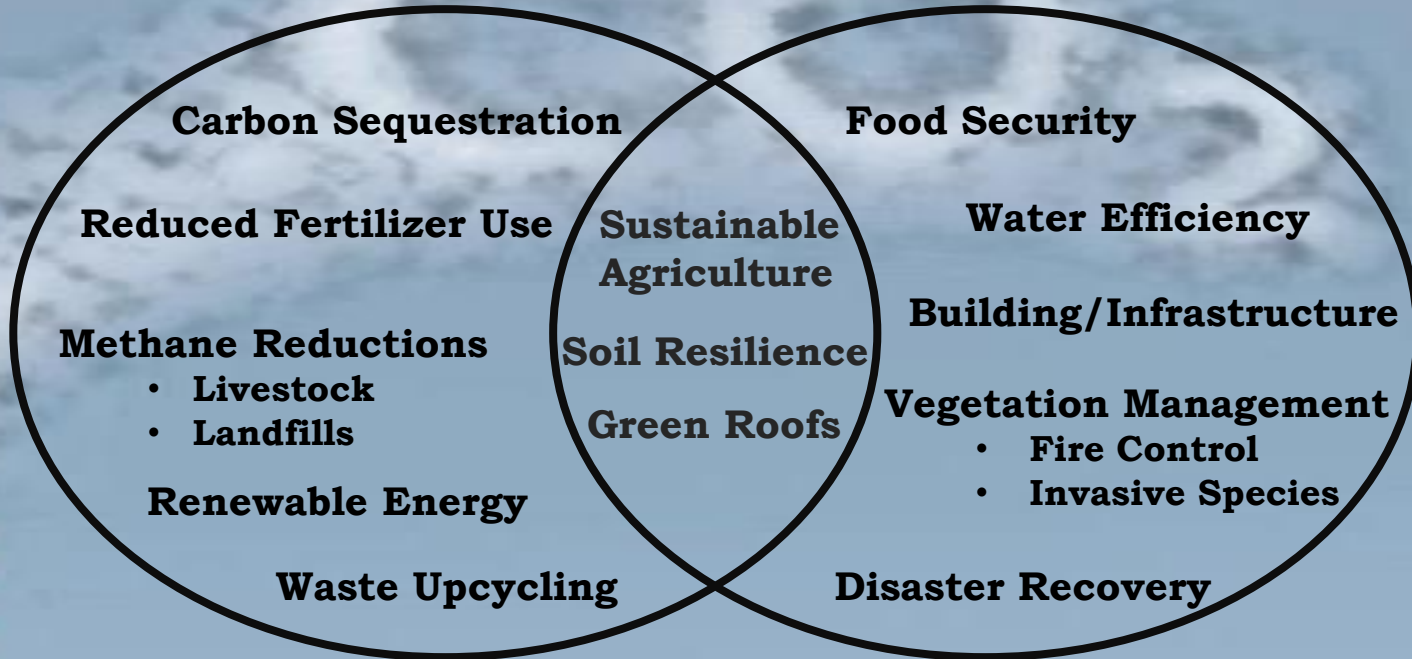
- Thermochemical conversion
- Scalability
- Co-products



# Biochar & Climate Change

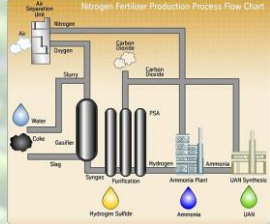
**mitigation**

**adaptation**



# Climate Change: Biochar & Nitrogen

## Nitrogen production



11.2. Commercial Examples | netl.doe.gov



## Nitrogen application



50 – 75% LOST



### Vaporization/oxidation into **AIR**

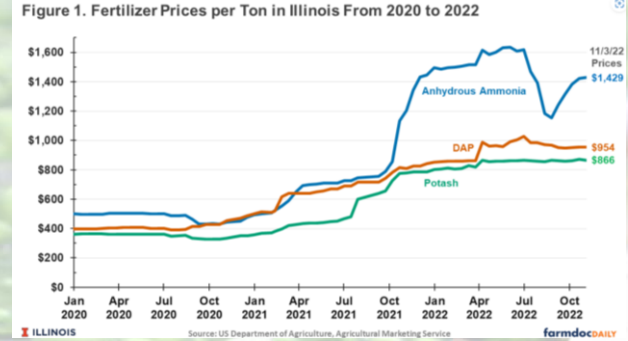
- Air pollution
  - Asthma & other health impacts
- Nitrous oxide
  - GHG 300x worse than CO<sub>2</sub>
  - In atmosphere for 100+ years

### Leaching into **SOIL**

- Groundwater contamination
- Soil Acidification
- Biodiversity loss

### Run-off into **WATER**

- Algal blooms (more GHGs)
- Eutrophication (fish kill)



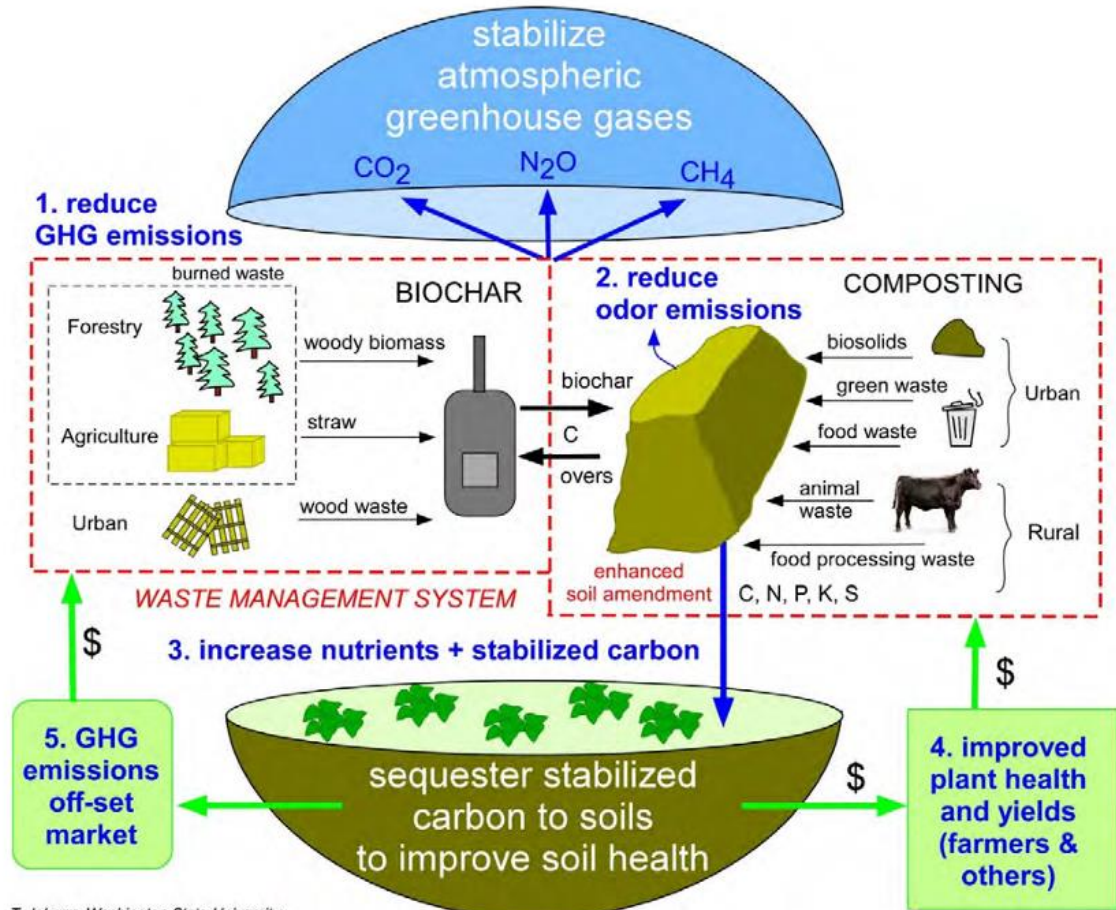
- N fertilizer contributes ~2% of global GHGs
- Uses 3 – 5% of world's fossil fuels (mostly NatGas) but projected to account for largest share of growth through 2026.

### Benefits of biochar-based N fertilizer

- Need less N fertilizer as it improves NUE => cost and carbon savings
- Less leaching & run-off
- Improves pH (mitigates soil acidification)

# Composting & biochar

- Reduces GHGs
- Reduces odors
- Improves nutrient mgmt
- Reduces time to finished compost
- Reduces time to finished compost
- Enhances microbial diversity and activity
- Longer lasting carbon (eligible for carbon removal credits)
- Immobilizes potentially toxic metals, herbicides, organic pollutants

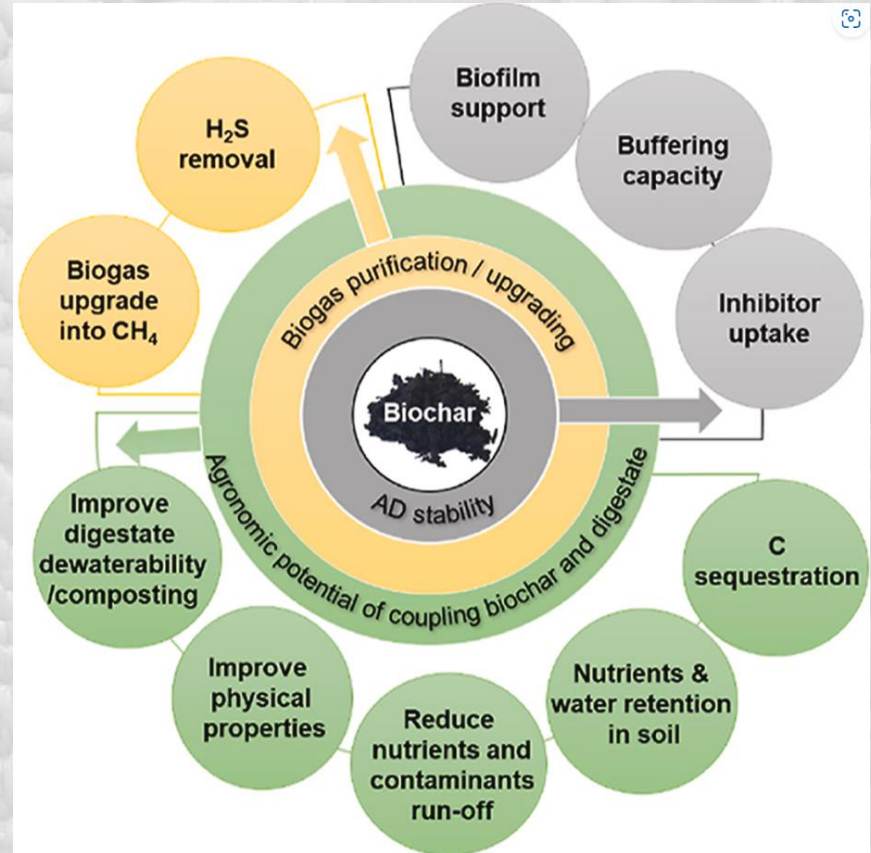


T. Jobson, Washington State University

Figure 7.5. Incorporation of biochar in composting operations can yield multiple benefits.

# Anaerobic digestion & biochar

- Reduces volume of digestate quickly
- Improve quality & quantity of CH<sub>4</sub>
- Heat can be used to heat up digester
- Longer lasting carbon





# Federal Support



- **NRCS Soil Carbon Amendment Protocol**
- **USFS support for US Biochar Initiative**

# Want more info?

- **IBI Biochar Academy** (June 19 – 30) & **Field Days** (June 22 – 23)
- **International Biochar Initiative**
- **US Biochar Initiative**
- **US Forest Service Webinars**



**CHARpe  
Diem!**

# Briefing Series: Farm Bill in Focus



**EESI**  
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**Every Other Wednesday**

**The Process and Path Forward for Passing a Bipartisan Farm Bill | Recording Available**

**Climate, Energy, and Economic Win-Wins in the Farm Bill | May 10, 1:30-3:00 PM EDT**

**Unlocking Rural Economies: Farm Bill Investments in Rural America | May 24, 2:00-3:30 PM EDT**

**The Future of Forestry in the Farm Bill | June 07, 2:00-3:30 PM EDT**

**Conservation Practices from Farms to Forests and Wetlands | June 21, 2:00-3:30 PM EDT**



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