Opportunities For Biochar Production To Reduce Forest Wildfire Hazard, Sequester Carbon, and Increase Agricultural Productivity of Dryland Soils

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INTRODUCTION

ADRESSING NATIONAL CONCERNS WITH NOVEL TECHNOLOGIES.

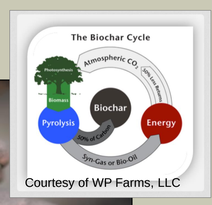

Courtesy of J. Bailey

- 200 million acres of land face the risk of catastrophic wildfire.
- Climate change threatens forested and agricultural ecosystems.
- Increasing water stress and increasingly acidic soils limit plant growth.
- Few strategies efficiently use low-value timber from wildfire risk reduction.
- Biochar has the potential to improve agricultural soils. Currently a limited supply of biochar restricts the ability of growers to apply biochar to agricultural lands just as the limited demand for forest harvest residues restricts the ability of foresters to fund restoration projects. Does a forest-origin biochar strategy pair these reciprocal needs?
- This study jointly optimizes wildfire hazard reduction treatments, biochar facility locations, and agricultural field applications to promote forest restoration, forest-related employment, increased agricultural competitiveness, and carbon sequestration.

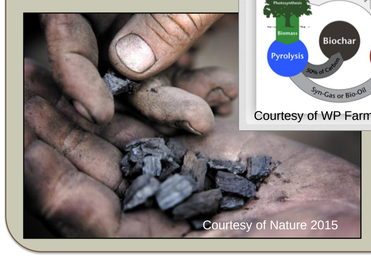
QUESTION AND APPROACH

QUESTION: DOES THE PRODUCTION OF BIOCHAR EFFICIENTLY OFFSET THE COST OF REDUCING WILDFIRE HAZARD, SEQUESTER FOREST-ORIGIN CARBON, AND INCREASE AGRICULTURAL PRODUCTIVITY?

OVERALL APPROACH: ENLIST AN INTERDISCIPLINARY TEAM OF FOREST AND AGRICULTURAL SCIENTISTS, FORM PARTNERSHIPS WITH INDUSTRY, AND DEVELOP USEFUL MODELS.



Courtesy of WP Farms, LLC


Courtesy of Nature 2015

A1. Optimize woody biomass collection and transport, and biochar production and application in the Upper Klamath Basin.

A2. Evaluate the physical properties of forest-origin biochar and its function as a soil amendment.

A3. Optimize fire hazard reduction in the context of biochar production.

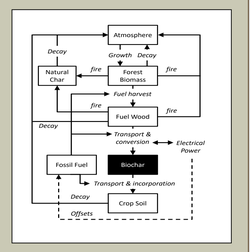
A4. Identify long-term carbon consequences of an optimized forest-to-field biochar production chain.

AGRICULTURAL / CARBON RESEARCH

A2 and A4 METHODS AND CONTRIBUTIONS

Team Members
Kristin Trippe (USDA ARS)
John Campbell (FES)

- Provide in-depth description forest-origin biochar.
- Pair biochar properties with agricultural soils to optimize the effect of biochar application.
- Greenhouse and laboratory analysis to determine if biochar amendments mitigate the effects of drought.
- Determine ability of biochar to sequester carbon.



Model input

Wildfire Hazard Reduction

Biomass utilization strategies

The impact of this biochar on soil health and drought mitigation

output

Courtesy of R. Zamora

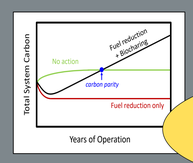
output

output

output

Model input

Steady source of biochar



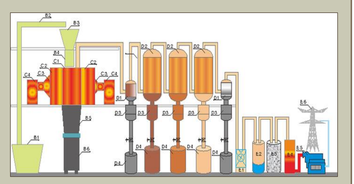
Carbon sequestration model

Model input

A2 and A4 CONTRIBUTIONS

Team Members
Rolly Liu (BSEI)
Chris Tenney (WP)

- Technical support related to application of biochar to agricultural soils.
- Prepare and ship biochar samples for property testing.
- Provide technical support for developing capital and operating expenditures for potential plant sites.



BSEI INC and WALKING POINT FARMS

OUTREACH

Partner with:

- Oregon Forest Biomass Working Group
- Oregon State-Wide Wood Energy Team
- Northwest Biochar Working Group
- OSU Extension
- Present information on biochar and assist early adopters.
- Provide advice in fire hazard reduction prescription development.
- and other outreach activites!

Team Members
Stephen Machado (OSU)
Marcus Kauffman (ODF)
Daniel Leavell (OSU)

FOREST AND BIOMASS RESEARCH

METHODS AND CONTRIBUTIONS A1, A3, and A4

Team Members
John Sessions (FERM)
John Bailey (FERM)
John Campbell (FES)
David Smith (WSE)

- Conduct a shift level productivity study using emerging steep slope harvesting technology to develop a harvest cost model.
- Refine previous models that identify optimal wildfire risk reduction treatments.


Courtesy of J. Sessions

- Develop and modify silvicultural prescriptions across landscapes
- Use previously developed decision support models to optimize transport from forest to plant, and plant to field.
- Establish costs for building and operating the biochar production facility.

- A biochar supply chain decision support model that determines if production of forest-origin biochar provides a win-win-win scenario for wildfire risk reduction, biomass utilization, agricultural productivity, and carbon sequestration.
- A description of biochar properties.
- A collection and transportation model for treating stands on steep slopes using state-of-the-art harvest and transport technologies.
- A landscape-level hazard reduction assignment model, including a carbon accounting framework.

NEW KNOWLEDGE