

Straw Gasification with Biochar: **An Alternative to Open field Burning**

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**Agricultural Burning and Research Task
Force**

Recently Emerged New Technology: Straw Gasification

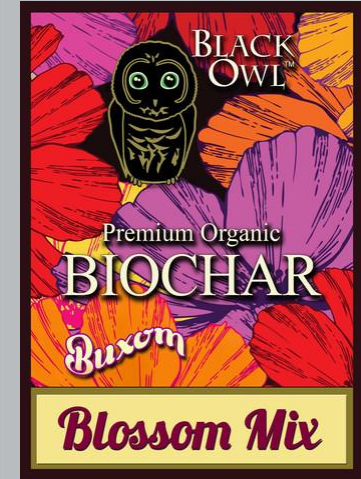
Straw gasification is a very recently emerged technology – Model 001

- Gasification drives off the volatile gases from organic matter and leaves the carbon
- It is commercial – Ag Energy-Solutions (Ag Energy) of Spokane is an example – Terry Bourne, Stump Farmer Farms, Sprague, WA.
- The Gady Farm in Rockford, WA has a straw gasifier – Farm Power is not yet fully commercial
- Gasifying straw has different design requirements than wood waste
- Gasifiers can produce 3 products/revenue streams: Power, thermal energy, & biochar

Fully Emerged New Product: Biochar

Biochar is a stable form of carbon used in environmental remediation and agriculture

- It too is fully commercial
- Example: Black Owl Supreme – 10 products in 6 states
 - 5 products for environmental remediation
 - 5 products for agriculture
 - Everson, Washington company
- There are different kinds and characteristics of biochar depending on purpose and use
- Biochar can be engineered for specific uses
- It holds on to nutrients & moisture
- It also has a very high *ph* value – Can function like adding lime to sweeten the soil



Stump Farmer Farms IBP Installation



Integrated Biomass Platform



Turning a waste or a pollutant



Into valuable products—
Electricity
And
Biochar



The Business Case for Straw Gasifiers

Turning a waste stream with permit fee into 3 revenue streams

- Power generation either for on-site use (typically pumping of water)/net metering or sale to the utility with double Renewable Energy Credits
- Thermal energy – For use in the gasifier plus heating and cooling with absorption chillers
- Agricultural biochar
 - Holds moisture at root zone (especially for sandy soils);
 - Change the *ph* after years of fertilizer use
 - Improve microbial action
- “I’ve been mining the carbon out of the soil for 40 years. I used to get 100 bushels to the acre, now I’m in the 60s” – Quote from Ferry County farmer Merrill Ott

Proposal Overview

Straw gasification for biochar goal: Speeding adoption of this new technology and product as an alternative to field burning of straw.

There are 3 objectives:

1. Determine the current state of reliable information about straw gasifiers and this type of biochar. It is anticipated that the information is scattered, thin & anecdotal;
2. Identify and map missing areas of information, begin to develop solid documentation of the benefits and produce lab testing results of the biochar; and
3. Develop factsheets, a website and give presentations

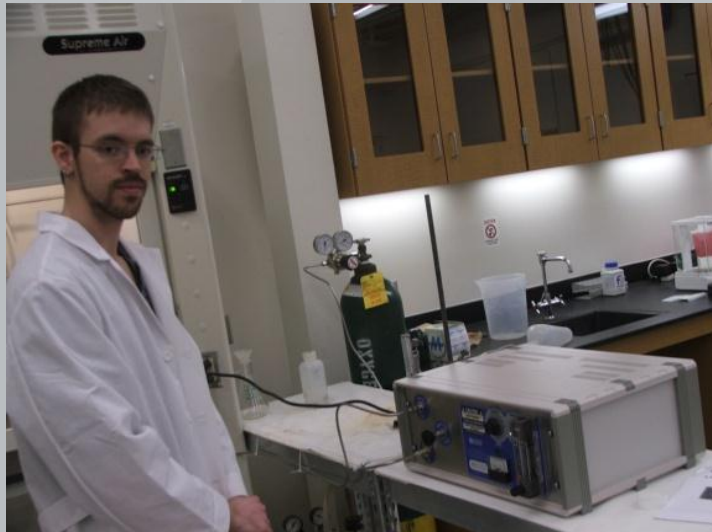
Developing Reliable Information

Two types of analysis will be conducted to develop information

- Economic analysis: We will use the WSU Energy Program's RelCost Financial - An open source, Excel based software tool that has a wide of economic and financial analysis capabilities. Capabilities include a wide range of farm level ROI & payback analysis with full proformas. A greenhouse gas calculator will also be used based on EPA information. This analysis will be done by Dusty Moller and Dr. Carolyn Roos.
- Biochar characterization: Biochar can be engineered/tuned for specific uses and purposes. The WSU's Biological Systems Engineering Program has a very strong thermochemical conversion laboratory. Laboratory service will be purchased for \$12,500. The laboratory operates under the guidance of Dr. Manuel Garcia-Perez.

WSU THERMOCHEMICAL CONVERSION PROGRAM

TO DEVELOP *NEW PRODUCTS FROM BIOCHARS*



Biochar

Modifications of bio-
char surface chemistry
and the development
of new Products

Advanced Soil
Amendments for carbon
sequestration
Adsorbent for
environmental application

Timeline

The timeline for the 3 projects objectives is as follows:

- Objective 1: Determine the current state of reliable information about straw gasifiers and straw sourced biochar – Months 1-3
- Objective 2: Identify and map areas of missing information & begin to develop solid documentation of the benefits of straw gasification and straw based biochar – Months 3-15
 - Biochar laboratory work – Months 6-12
 - RelCost Financial analysis – Months 9-15
- Objective 3: Information and outreach with final factsheets – Months 7-15 with project completed on 5/31/17

Key Staff

The key staff are:

- David Sjoding – Principal Investigator, MPA, Univ. of Washington – 35 years of energy and management experience
- Dusty Moller – Key staff assigned to implement the proposal – MBA, Univ. of Arizona with broad and varied private sector, trade association and university experience. Biochar expert.
- Dr. Manuel Garcia-Perez – 17 years experience in thermochemical conversion of lignocellulosic materials

Budget - \$77,500

The proposed budget is straight forward

- David Sjoding – 40 hours
- Dusty Moller – 449 hours
- Dr. Carolyn Roos – 15 hours
- Thermochemical Lab analysis of biochar - \$12,500
- Travel - \$1,000



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internationally recognized energy experts