(Please contact John Miedema at jmiedema@peak.org or Gloria Flora, U.S. Biochar Initiative, glfora@biochar-us.org with your feedback on this draft.)

DECLARATION OF SUSTAINABILITY FOR BIOCHAR PRODUCTION

To set forth a shared vision and direction for the future of this technology among Biochar proponents to prevent unintended consequences that could potentially arise from this process.

To make clear to a broader stakeholder group that the pioneering efforts in Biochar production are directed toward helping people and the planet and creating value.

Whereas Biochar Production creates value in all the following ways:

- Creates energy
- Sequesters carbon
- Creates a valuable soil amendment

And whereas, each of these means of value creation could lead to a single end goal of wealth creation at the expense of people and the planet…

Let it be known that we Biochar producers, marketers and organizations shall strictly adhere to protocols that promote the health of people and the planet as the process creates value. Inherent in this process is the fact that Biochar must be created from terrestrially derived carbon (non-fossil) in a manner that ensures ecologically sound landscapes remain, with minimum production impacts and positive outcomes in a complete life-cycle analysis.

These Sustainability Protocols are based on Quantifiable Baseline Practices:

1. Biomass sourced primarily from agricultural/silvicultural residues
2. Minimal carbon debt from land-use changes (10-yr. maximum payback time, < 22 Mg CO2-Ceq ha)
3. No previously unmanaged lands converted to biomass for biochar production; for example, abandoned croplands, yes; native forests or grasslands, no. (Measurements based on 2010 certified regional and local land classification systems and landscape history.)
4. Modern pyrolysis technology use eliminates soot, methane ($CH_{4)}$, and nitrous oxide (N_2O) emissions and captures energy released as process heat, bio-oil, and flammable gases.

In addition to the Sustainability Protocols that follow, we propose the following be developed and adopted:

- Protocols for the Creation of Biochar Energy
- Protocols for the Sequestration of Carbon from Biochar Production
- Protocols for creating Biochar soil amendments

Introduction

We thank John Miedema of Pacific Northwest Biochar for leading this effort and the Sustainable Biodiesel Alliance for allowing us to utilize much of their work in our development of sustainability standards for the Biochar community. Other valuable assistance was provided by co-editor Max DeRungs, Tracey Miedema, Jim Amonette, Ron Larson, Albert Bates, Gloria Flora, Bill Holmberg, and Jim Fournier.

We hope to provide a process for biochar stakeholders (those actually farming, producing, distributing and using biochar) to determine what methodologies they would need certify and adopt to ensure that they are in fact making and utilizing biochar in a socially, environmentally and economically sound

manner . The result is that in the first phase of these baseline sustainability practices, we are developing an approach that is practical and market driven but based on the best science and information available.

The desire is to develop practices that can be implemented immediately while research and technology continue to develop and evolve. This will be an on-going project-- reflecting the core principle that true sustainability is a dynamic journey and not a distinct destination. As science and policy continue to progress, the Biochar Sustainability Protocol will adopt principles according to the most up to date research and data available. There are other similar efforts currently underway globally, and PNW-Biochar is committed to working with these efforts to ensure consistency among protocols.

Process

The following protocols lay out principles, which set goals for all participants in the life-cycle of biochar. The principles are followed by baseline practices. The baseline practices are intended to set the threshold for where sustainability begins. As PNW-Biochar and the U.S. Biochar Initiative gather information from the implementation of the practices through pilot programs and participating PNW-Biochar and the U.S. Biochar Initiative members, we will be developing sustainability standards and indicators with which to measure them. These standards will ultimately serve as the criteria for third party certification.

PNW-Biochar and the U.S. Biochar Initiative hopes to include representatives from all segments of the biochar industry, in an open forum, to discuss the definition and dynamics of sustainability as it applies to environmental, social and economic concerns. This initiative intends to create four work groups representing the industry segments of biochar feedstock, production, distribution and commercial end users. The following document will act as a framework for the development process of these guidelines.

Guiding Principles

The lifecycle of biochar from feedstock to the end use which grows more feedstock is understood as a closed loop process. It is a cradle-to-cradle approach that declares the value of natural and human capital that makes a sustainable process. From short to long-term views, the principles can be broadly grouped as having a political, economic, social or environmental nature.

1. Political
    a. Policies – *Policies will be just, equitable, ethical and appropriate in scale for desired outcome.*
    b. Democratic Processes – *All equitable practices that support democratic governance are welcome.*
    c. Round Table – *No hierarchy or power structure is necessary besides a convener and an agreed upon decision process.*
    d. Inclusive – *All stakeholders including those speaking on behalf of future generations and the environment are welcome.*

2. Economic
    a. Subsidies -- *Subsidies are not required for profit.*
    b. Carbon Market – *A viable carbon market supports stable (recalcitrant) carbon sequestration.*

3. Social
    a. Food Security -- Sustainable *production of biochar does not jeopardize food security by displacing land used for growing critical food crops with biochar feedstock crops.*
    b. Local Communities -- *Local communities are an integral part of the development of the Sustainable biochar industry. Local strategies for biochar production with citizen input are created. Local consumption of Sustainable biochar is prioritized and encouraged.*
    c. Communities and Workers -- *Family and small holder farmers are not to be displaced to grow or harvest biochar feedstock. Farmers should receive fair compensation for the biochar feedstock they produce. The health and safety of workers and communities should be protected. In addition, fair / livable wages for agricultural workers and workers at biochar production facilities are ensured.*

4. Environmental Concerns
   a. Greenhouse Gas Emissions -- *Sustainable biochar energy production results in net greenhouse gas (GHG) reductions compared to other fossil and biofuels when analyzed via a life-cycle assessment. Fossil energy used in growing, transporting and processing biochar must be considered. Converting land from wilderness or grasslands to plant biochar feedstock crops also releases GHG and is not sustainable.*

   b. Energy Conservation -- *Sustainable biochar production improves energy and resource conservation. Wasteful use of fossil fuels should not be replaced with waste of energies created during the production of biochar. Instead, conservation of energy shall be a priority.*

   c. Soil -- *Sustainable biochar does not degrade or damage soils and should contribute to long-term maintenance and improvement of soil quality*.

   d. Water -- *Sustainable biochar production does not contaminate water and utilizes water resources efficiently.*

   e. Air -- *Sustainable biochar production and use improves air quality and does not lead to increased air pollution as compared to fossil fuels.*

   f. Biodiversity Conservation -- *Sustainable biochar production does not lead to the destruction, degradation or declassification of high conservation value areas; areas of high biodiversity; habitats of rare, threatened or endangered species; or rare, threatened or endangered ecosystems. Protected areas, including grasslands, wetlands, forests etc. should not be declassified or appropriated for biochar crop production. At the landscape level, Sustainable biochar production systems contribute to the conservation and maintenance of native biological diversity. (More information on indirect land use change will be included as data become available)*

   g. Agrochemicals -- *Sustainable biochar crop production minimizes, and eliminates whenever possible, the use of dangerous agrochemicals. Agrochemicals that are hazardous to the environment, workers, and local communities will not be used. Chemicals used are non-persistent and chemicals that are endocrine disrupting, carcinogenic or mutagenic in humans should be phased out. Preference should be given to the selection of crops and cropping systems that are productive and sustainable without reliance on agrochemicals.*

   h. Next Generation Feedstock -- *Feedstock that is currently under development but not yet used commercially should be developed with the consideration of the aforementioned principles.*

Definitions

Sustainability - the ability to meet the needs of the present without compromising the ability of future generations' abilities to meet their own needs. **U.S. Environmental protection Agency*

Sustainable Biochar - is derived from terrestrial non-fossilized bio-carbon, produced in a manner that, on a life-cycle basis, including greenhouse gases; reduces competition for, and use of, natural resources and energy; reduces waste generation; preserves habitat and ecosystems; maintains or improves soils; avoids use of genetically modified organisms; and provides community economic benefit that results in jobs and fair labor conditions….. **PNW-Biochar and U.S. Biochar Initiative*

SUSTAINABILITY PROTOCOLS FOR BIOCHAR PRODUCTION

PRODUCTION *(see also Quantified Baseline Processes, page 1)*

Air Emissions

Principle: Sustainable biochar production minimizes the release of pollutants into the air.

Background Assumptions:

1. Combustion and torification can result in the release of air contaminants. These contaminants can have negative impacts on environmental and public health. Targeted air pollutants of concern include:
    a. VOC's – *volatile organic compounds – (methanol is a VOC*)
    b. PAH's -- *Polycyclic aromatic hydrocarbons* (*PAHs*)
    c. Particulates, soot and black carbon
    d. NOx – mono nitrous oxides
    e. SOx – sulfur oxides
    f. CO – carbon monoxide
    g. GHG – greenhouse gasses (carbon dioxide-CO_2, methane-CH_4, nitrous oxide-N_2O, hydrofluorocarbon-HFC's, sulfur hexafluoride-SF_6, perfluorocarbon-PFC)
    h. Nuisance odors
2. Biochar plant emissions typically result from:
    a. Fugitive emissions
    b. Process and auxiliary combustion driven equipment such as forklifts, generators boilers for process heat, plant space heating (not process), power takeoff (PTO) equipment (unloading trucks), etc.
3. Pollutant releases may occur at the following points in a typical biochar production process, dependent on controls implemented:
    a. From headspace when tanks are filled [bio-oil and biochar storage tanks, mix and reactor tanks, wash water and fossil fuel powered transport]
    b. From piping leaks – if present
    c. From open exposures

Baseline Practices - Sustainable biochar Producers shall:

1. Obtain an air permit from local/state/fed authority (specific requirements vary).
2. Determine the source and measure the level of fugitive emissions if possible.
3. Calculate potential to emit (typically through material balance calculations) when it is not possible to determine exact levels of fugitive emissions.
4. Disclose precautions that are taken to avoid fugitive emissions (typically required by law).
5. Control the release of vapors through strategies such as:
    a. Install Vapor Recovery Systems
    b. Establish "closed" production system – must have no open vents, ports, or man-ways on storage or processing tanks

Water Resources

Principle: Sustainable biochar production does not contaminate water above or below ground and utilizes water resources efficiently.

Background Assumptions:

1. Biochar production can create effluent water during production
2. Effluent water criteria monitored by biochar facilities include:
    a. FOG (Fats, Oils, Grease) including Bio-oils andTar
    b. BOD (Biological Oxygen Demand)
    c. TSS (Total Suspended Solids),
    d. COD (chemical oxygen demand)
    e. pH levels

Baseline Practices - Sustainable biochar Producers shall:

1. Obtain all required local/state/federal water and wastewater permits.
2. Perform calculations and testing to identify the volume and constituents of proposed discharges.
3. Understand the controls, systems and regulations that need to be in place to accommodate both storm water events and spill control.
4. Minimize, treat or eliminate wastewater.
5. Discharge process water to municipal waste treatment facilities, treat and apply to land, send to commercial composting facilities, treat and re-use, evaporate on site, or handle in any other environmentally responsible manner.
6. Determine appropriate local conditions to maximize local benefit.

Waste Handling and Reduction

Principle: Sustainable biochar production ideally does not create waste. Wastes that are created are recycled. If waste cannot be recycled then it is disposed of in an environmentally responsible manner.

Background Assumptions - Biochar Production can generate significant wastes from a variety of sources including but not limited to:

1. Packaging
2. Waste chemicals, oils and tars
3. Tank bottoms
4. Absorbent
5. Filters, rags
6. Office waste and recyclables
7. Ash from boilers

2. Baseline Practices - Sustainable biochar Producers shall:
    a. Eliminate waste or re-use, repair, recycle where possible,
    b. Inventory and analyze solid and liquid waste
    c. Know where waste is going
    d. Handle waste in an environmentally responsible manner
    e. Eliminate off gassing from solid and liquid waste products
    f. Establish measures for continued improvement

Plant Energy

Principle: Sustainable biochar production utilizes renewable energy for improved energy and resource conservation and reduced greenhouse gas emissions. Wasteful use of fossil energy cannot be replaced with wasteful use of renewable energy. Instead, significant reductions in total consumption, together with increased conservation, are a priority.

Background Assumptions: Plants use energy for processing activities and standard operating activities; activities include but are not limited to:

1. Process heat (heat feedstock storage tanks, reactor vessels, wash water and stored glycerol). Process heat sources may be a boiler, solar, or electric.
2. Electrical sources for process related and general operations (lighting, security lighting, running lab equipment, running processing equipment)
3. Transportation of feedstock consumes energy

Baseline Practices - Sustainable biochar Producers shall:

1. Audit energy use and establish a baseline for continued improvement
2. Increase plant efficiency to reduce energy consumption
3. Use biochar or renewable energy to fire boilers, generators and on-site equipment
4. Use renewable energy sources on-site whenever possible (geothermal, renewable electricity, wastes and/or biochar, as well as purchasing renewable credits)
5. Employ cogeneration (combined heat and power – heat from combustion to provide electricity) whenever possible
6. Use waste energy from a third party (co-locating to use waste steam, landfill gas) whenever possible
7. Use passive solar, day lighting, and energy efficient bulbs
8. Refer to LEED standards for energy efficiency
9. Monitor energy consumption (Kwh/gallon output, BTU/gallon output) and energy balance (energy input and output) actively.

Sustainable Sourcing

Principle: Sustainable biochar plants support other industries that are locally owned and environmentally responsible. Sustainable biochar is produced from local feedstock using sustainable sourcing.

Background Assumptions: Biochar can have the greatest economic impact and the smallest environmental footprint by sourcing locally. This keeps more dollars in the local community and reduces carbon miles of materials and feedstock.

Baseline Practices - Sustainable biochar Producers shall:

1. Operate efficient used equipment when possible
2. Use LEED certification as a guideline for construction
3. Consider carbon miles when sourcing materials (See local definition.)
4. Use renewable chemicals such as bio-methanol or bio-ethanol when available
5. Use recycled methanol or ethanol from other industrial sources when available
6. Source materials including office supplies from local businesses. Local, then regional, then domestic.
7. Look to other groups for purchasing guidelines such as: www.bcorporation.net and www.epa.gov
8. Source feedstock from local sustainable providers when possible. (See feedstock guidelines.)

Community Benefit

Principle: Local communities are an integral part of the development of the Sustainable biochar industry. The health and safety of workers and communities should be protected. In addition, fair / livable wages for agricultural workers and workers at biochar production facilities are ensured. Local community benefit must be prioritized, because the power of local businesses can transform communities for the better by working cooperatively toward a shared vision.

Background Assumptions:

1. Sustainable biochar production can be beneficial to local communities
2. Social benefit is often inappropriately sacrificed for economies of scale

Baseline Practices - Sustainable biochar Producers shall:

1. Integrate local communities into the development of the sustainable biochar industry.
2. Create local strategies for biochar production with citizen input
3. Ensure fair wages for workers at biochar production facilities
4. Communities and farmers producing biochar should have, to the greatest extent possible, ownership of biochar production and processing facilities
5. Retain income generated from biochar production, to the greatest extent possible, within local producing communities from the feedstock to processing
6. Prioritize local consumption over transporting or exporting biochar or biochar feedstock away from the communities and regions that produce them

Plant and Worker Safety

Principle: The health and safety of workers and communities, both present and future are protected in Sustainable biochar production.

Background Assumptions: Worker safety can be affected by worker training, plant design and working conditions.

Baseline Practices - Sustainable biochar Producers shall:

1. Implement documented Safety/Health Plan and Standard Operating Procedures
2. Use proper worker safety training (includes follow up training)
3. Conduct regular safety meetings this includes but is not limited to standard hazardous material training (8 hr per employee including all staff who work onsite – office, janitorial, etc.)
4. Conduct frequent safety meetings, audits, and drills
5. Meet all applicable building codes
6. Meet all applicable Fire Codes (NFPA)
7. Store all methanol and caustic materials in high hazard areas (create finite hazardous area)
8. Keep equipment well-maintained and in good working order
9. Provide clearly identified location and number of personal protective equipment, defibrillators, spill kits, first aid, washdown/eyewash equipment, etc.

Quality

Principle: Sustainable biochar is produced to the highest quality standard and meets or exceeds (ASTM) current version. *(verify current best practice)*

Background Assumptions:

1. Biochar is produced utilizing many different processes and many different feedstocks.
2. If not carefully monitored, this can result in inconsistent quality. Without quality additional resources will be used to rectify problems and negatively affect sustainability.

Baseline Practices - Sustainable biochar Producers shall

1. Maintain a documented quality program. An example of a documented quality program *(BQ9000 - place holder)*. However, individual producers can implement their own comprehensive quality program.
2. Report delivered cloud point and meet customer requirements (for bio-oil production *place holder—current best practice?*)
3. Keep certificates of analysis on file for all inventory and all inventory sold in the past 12 months
4. Take samples with a minimum 90-day retention time.
5. Follow handling guidelines described in Biochar Handling and Use Guidelines *(place holder—current best practice?)*
6. Verify cleanliness of transport tanks before filling
7. Educate end users on impacts of biochar performance and use. (?)

END USE

1. Quality
2. Sourcing and Availability
3. Biochar Blends

Quality

Principle: Sustainable biochar is produced to the highest quality standard.

Background Assumptions:

1. Biochar is produced utilizing many different processes and many different types of feedstock. If not carefully monitored, this can result in inconsistent quality being distributed to end-users.
2. End Users must handle, blend and store biochar properly to prevent the degradation of quality.

Baseline Practices - Sustainable biochar End Users shall:

1. Require producer to maintain a quality program and insure compliance through the procurement contract
2. Work with distributor and provide feedback on equipment performance
3. Keep certificates of analysis for all fuel in inventory
4. Train employees to read and interpret certificates of analysis
5. Follow handling and storage guidelines described in *Biochar Handling and Use Guidelines* (place holder—current best practice?*)*
6. Sample each distribution point
7. Keep detailed maintenance records, and change/service all equipment regularly.

Sourcing and Availability

Principle: Sustainable biochar is sourced from *(NAME)* certified producers within the community.

Background Assumptions:

1. Not all biochar is created equal.
2. To encourage biochar producers to adopt sustainable practices there must be some (monetary?) benefit for doing so.
3. Community based, biochar production is more sustainable than biochar sourced from outside the community.

Baseline Practices - Sustainable biochar End Users shall:

1. Source sustainable biochar from *(NAME)* certified producers if available
2. Source from local producer using local feedstock if *(NAME)* certified product is not available
3. Consider carbon benefit of sourced biochar against locally sourced, if locally produced biochar is not available

Biochar Blends

Principle: Biochar blends contain materials other than biochar to enhance performance and co-benefits.

Background Assumptions: TBD

Baseline Practices - TBD

DISTRIBUTION

1. Quality
2. Emissions
3. Sourcing/Procurement

Quality

Principle: Biochar is produced to the highest quality standard and meet or exceed ASTM? (*place holder—current best practice?)*

Background Assumptions:

1. Biochar is produced utilizing many different processes and many different feedstock types. If not carefully monitored, this can result in inconsistent quality being distributed to end-users.
2. Biochar must be handled, blended and stored properly to prevent the degradation of quality.
3. Biochar must be produced to a reliable standard of quality, in order to ensure consumer confidence and continued industry growth.

Baseline Practices: Sustainable biochar Distributors shall:

1. Purchase fuel that meets the federal standard ASTM D6751 or EN 14214 (?)
2. Follow handling and storage guidelines described in Biochar Handling and Use Guidelines *(place holder—current best practice?).*
3. Keep samples and certificates of analysis for all inventories.
4. Train employees to read and interpret certificates of analysis
5. Implement quality resolution program

Emissions

Principle: The production of sustainable biochar reduces GHG emissions when compared to fossil derived energy.

Background Assumptions:

1. Transportation of biochar over long distances can decrease the environmental benefits of biochar and increase emissions.
2. The use of biochar reduces GHG emissions

Baseline Practices - Sustainable biochar Distributors shall:

1. Use the highest practical blend of Sustainable biodiesel equipment and vehicles to reduce GHG emissions

2. Use *(NAME)* certified Sustainable biodiesel when available, if *(NAME)* certified biodiesel is not available then use biodiesel produced from sustainable feedstock (see feedstock guidelines)
3. Maintain transportation equipment with all emission equipment properly functioning
4. Include language in contracts with common carrier transporters a requirement to use biodiesel blends (?)

Sourcing/Procurement

Principle: Locally produced Sustainable biochar is sourced over biochar produced long distances from target market.

Background Assumptions: Biochar produced and consumed locally has a greater positive social, environmental and economic impact than biochar transported over long distances.

Baseline Practices - Sustainable biochar Distributors shall:

1. Consider carbon miles when purchasing and distributing biochar
2. Know supplier and quality
3. Source local *(NAME)* certified biochar when available
4. When *(NAME)* certified fuel is unavailable source locally produced biochar from local feedstock (see feedstock principles)
5. When *(NAME)* certified biochar is not available, source biochar produced locally from local feedstock, when locally produced biochar is not available source domestic biochar made from domestic feedstock, by a local producer.
6. Provide transparency of supplier / feedstock to the customer
7. Educate the end user about sustainability and community benefit. (?)

Feedstocks – *same as Quantified Baseline Practices above*

1. Biomass sourced primarily from agricultural/silvicultural residues
2. Minimal carbon debt from land-use changes (10-yr. maximum payback time, < 22 Mg CO2-Ceq ha)
3. No previously unmanaged lands converted to biomass for biochar production; for example, abandoned croplands, yes; native forests or grasslands, no. (Measurements based on 2010 certified regional and local land classification systems and landscape history.)
4. Modern pyrolysis technology use eliminates soot, methane ($CH_{4)}$, and nitrous oxide (N_2O) emissions and captures energy released as process heat, bio-oil, and flammable gases.

EFFECTED ENVIRONMENT

1. Soil Quality and Conservation
2. Water Resources Quality and Consumption
3. Ecosystem Protection and Biodiversity Potential
4. Climate – Emissions and Sequestration Potential
5. Energy Use
6. Fair Wages and Working Conditions
7. Community Benefit – Localization
8. Waste Biomass
9. Next Generation Feedstock

Soil Quality and Conservation

Principle - Sustainable biochar contributes to long-term maintenance and enhancement of soil quality.

Background Assumptions - The agricultural production of biochar feedstock crops can result in degradation and depletion of soil quality and quantity.

Degradation can include:

- Soil erosion, runoff and leaching
- Minimal soil infiltration and storage of rainfall
- Soil nutrient loss
- Soil structure loss
- Limited soil response to disease and insect pressure
- Limited microbial diversity
- Healthy and productive soils help increase rainfall infiltration and storage in the soil and require fewer imported nutrients.

Baseline Practices - Sustainable biochar feedstock producers shall

1. Control and minimize soil erosion by employing practices designed to prevent wind and water erosion.
2. Enhance soil organic matter levels, help reduce soil compaction, and promote carbon sequestration in soil (which helps counteract atmospheric change due to greenhouse gas emissions) by the following practices:
3. Reduce tillage where possible
4. Rotate crops
5. Recycle organic residues and materials back to the soil to increase soil organic matter and carbon levels
6. Plant cover crops when practical

Water Resources Quality and Consumption

Principle: Sustainable biochar production must protect water quality and conserve water resources.

Background Assumptions:

1. Soil sediment is the major source of water–body impairment in streams and lakes.
2. Soil sediment contains phosphorus and pesticides.
3. Drainage tiles are a major factor in stream pollution by nitrate. Eventually nitrate travels to ocean estuaries such as the Gulf of Mexico causing accelerated phytoplankton growth. Anaerobic zones then form because of phytoplankton decay.
4. Root zone drainage is necessary in much of the root zone for growth of crops.

Baseline Practices - Sustainable biochar feedstock producers shall:

1. Adopt water-conserving strategies as appropriate. These include new irrigation techniques, mulching, soil moisture monitoring and irrigation scheduling and may vary regionally.
2. Use best management practices and scouting to minimize nutrient use and loss, and to minimize pesticide use.
3. Place buffer strips around waterways to help prevent migration of soil and farm chemicals into surface waters.
4. Implement water use planning to help track and monitor water usage and eliminate waste.
5. Utilize irrigation management practices that factor in weather conditions, soil moisture, and plant need.

Ecosystem Protection and Biodiversity Potential

Principle: Sustainable biochar production does not lead to the destruction, degradation or declassification of high conservation value areas; areas of high biodiversity; habitats of rare, threatened or endangered species; or rare, threatened or endangered ecosystems. Protected areas, including forested areas, will not be declassified or appropriated for sustainable biochar crop production. At the landscape level, sustainable biochar production systems contribute to the conservation and maintenance of native biological diversity.

Background Assumptions:

1. Forests, grasslands and other habitats and ecosystems can be damaged by encroachment of biomass crops.
2. In some cases protected lands have been declassified or appropriated for biomass crop production.
3. Native ecosystems can be negatively impacted by biomass crop production.

Baseline Practices: Sustainable biochar feedstock producers shall:

1. Protect biological diversity and protect previously undeveloped habitats
2. Use native species when possible and farming systems in a way that does not deplete soil nutrients or reduce soil biodiversity
3. Avoid using genetically engineered crops unless proven safe by independent third party certification.
4. Ensure genetically engineered organisms are not released into the environment during processing
5. Use of GMO must be reported and documented
6. Follow principles and guidelines for sustainable forest management such as those produced by the Forest Guild and the Forest Stewardship Council.
7. Avoid conversion of Conservation Reserve Programs (CRP) lands to biomass production
8. Retain sufficient biomass on agricultural and forest lands to meet ecological and sustainability requirements for micro and macro habitats, soil and water health and plant reproduction and vigor
9. Protect and enhance aesthetic qualities of the landscape in the removal of biomass and in the application of biochar
10. Protect and enhance wildlife and fisheries habitat in the removal of biomass and in the application of biochar

Climate – Emissions and Sequestration Potential

Principle: Sustainable biochar crop production and oil seed processing does not increase GHG emissions and should increase the sequestration potential of current land use when possible.

Background Assumptions:

1. The production of biochar feedstock can negatively impact the climate by damaging or eliminating valuable carbon sinks.
2. Excessive tillage and fertilizer/agrochemical applications can lead to increased emissions.
3. Seed oil extraction can produce air emissions.

2. Baseline Practices: - Sustainable biochar feedstock producers shall

1. Use marginal lands or existing croplands versus forests, grasslands or pristine ecosystems for biochar feedstock crops
2. Not displace critical food crops, rather should rotate with food crops when possible

3. Keep equipment well maintained and in good working order
4. Utilize the highest biochar blend practical or available in all diesel equipment
5. Utilize minimal tillage for feedstock production
6. Consider carbon mile distance to crush and market (see local definition)
7. Evaluate and select extraction technology for minimum air emission impact
8. Sample soils to determine appropriate levels of application of fertilizers and chemicals

Energy Use

Principle: Sustainable biochar production improves energy and resource conservation. Wasteful use of fossil fuels should not be replaced with wasteful (inefficient, polluting) production of biochar. Instead, significant reductions in total consumption, together with increased conservation, shall be a priority. The production of sustainable biochar should utilize alternative and renewable energy to improve energy and resource conservation.

Background Assumptions:

1. Production of biochar feedstock requires input of energy
2. Transportation of feedstock consumes energy

Baseline Practices: Sustainable biochar feedstock producers shall:

1. Determine baseline energy usage and monitor efficiency with continuous improvement as a goal
2. Use biochar/syngas/ bio-oil/ waste heat and renewable fuels (sustainable biofuels, wind, solar) when possible
3. Use the most energy and economically efficient technology available. Evaluation of technology must include energy use and air emission profile.
4. Must make air emission profile available and transparent.
5. Carbon footprint for the biochar must be made available to the consumer.

Fair Wages and Working Conditions

Principle: Fair wages, non-discriminatory and safe working conditions are provided for workers in Sustainable biochar feedstock production.

Background Assumptions: Unsafe, discriminatory and hostile working environments are not sustainable.

Baseline Practices - Sustainable biochar feedstock producers shall:

1. Create and support a fair and safe work place
2. Follow the law regarding employment of minors and discrimination when hiring new employees and managing existing employees.
3. Set goals for workplace safety and establish rewards.
4. Implement all aspects of health and safety laws and regulations and continually look for ways to improve workplace safety.
5. Provide fair and livable wages to all employees based on job descriptions and location
6. Meet all applicable OSHA regulations regarding safety of workers
7. Support or be neutral to labor organizations.
8. Meet OHSAS 18001:2007

Community Benefit – Localization

Principle: Local communities are an integral part of the development of the sustainable biochar industry. Local strategies for biochar production with citizen input are created. Local community benefit is prioritized, because the power of local businesses can transform communities for the better by working cooperatively toward a shared vision.

Background Assumptions:

1. Locally owned facilities are more than employers and profit-makers; they are neighbors, community builders and the starting point for social innovation. (See principles and guidelines developed by Business Alliance for Local Living Economies (BALLE) and similar organizations.)
2. Independent family farms can benefit from feedstock production.

Baseline Practices:

1. Sustainable biochar feedstock producers shall
2. Purchase feedstock from local producers whenever possible
3. Make local purchasing of other goods and services a priority

Waste Biomass

Principle: Sustainable biochar is produced from sustainable feedstock. Intercepting the waste stream is of highest priority for obtaining biomass.

Background Assumptions:

1. Waste Biomass can be an ideal sustainable feedstock for biochar production because they are recycled or are waste products
2. Biochar from waste reduces land fill usage allowing biochar to be a solution to an environmental problem.
3. Potential Feedstocks include:
   a. Forest Slash and Thinned Material intended be burned on site
   b. Yard, Orchard & Urban Forest Trimmings destined for landfills
   c. Agriculture Crop Waste
   d. Brush and residue from clearing from land *(not cleared purposefully for biomass creation)*
   e. Processing Waste *(mill waste, paper sludge)*
   f. Processing waste from food stuffs (*e.g. residue from sugar production)*,
   g. Manure and poultry litter in excess of composting needs
   h. Offal
   i. Spoiled Hay or Straw excess to composting needs
   j. Untreated Construction Waste *(from processing or post-construction)*
   k. Methane Digester Residue
   l. Algae Residue from Energy Production

Baseline Practices - Sustainable biochar feedstock producers shall:

1. Procure and handle waste within state and local regulations
2. Handle waste in a manner that avoids spills, minimizes nuisance odors and inhibits vermin infestation
3. Information regarding the operations of production systems shall be transparent
4. Producers of waste biomass must provide a safe and fair working environment for employees
5. Consider distance (carbon miles) from source in the sourcing decision

Next Generation Feedstock

Principle: Research and development of sustainable, emerging technologies is critical for biochar industry growth. These technologies shall be developed with the consideration of the aforementioned principles.

Background Assumptions:

1. Feedstock that does not compete for food must be developed sustainably.
2. Genetically modified organisms and invasive species, when not adequately contained, can damage and destroy ecosystems.
3. The environmental and social ramifications of GMO use are still undetermined, as GMO use has yet to be proven safe by independent third party research.

Baseline Practices:

1. Sustainable biochar feedstock producers shall
2. Conform to all applicable feedstock principles and practices
3. Not use genetically modified or invasive species for emerging fuels feedstock unless proven safe by third party evaluation.
4. Implement control efforts to ensure containment of GMO and other invasive species.

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PROPOSED SUBCOMMITTEES TO FURTHER DEFINE MEASURABLE CRITERIA

1. Economic Sustainability Criteria Development

a. Develop a minimum number of specific, measurable criteria that will meet the goals of Econ Sustainability, starting with the Mission & Principles Sustainable Biochar Document

b. Select best metrics used in other standards that measure these criteria; and clarify what we want to measure if existing metrics are not adequate.

** Consider time-scale, macro factors (cumulative effects of Biochar production/utilization practices), and impacts of existing and emerging technologies.*

2. Social Sustainability Criteria Development

a. Develop a minimum number of specific, measurable criteria that will meet the goals of Social Sustainability, starting with the Mission & Principles Sustainable Biochar Document

b. Select best metrics used in other standards that measure these criteria; and clarify what we want to measure if existing metrics are not adequate.

** Consider time-scale, macro factors (cumulative effects of Biochar production/utilization practices), and impacts of existing and emerging technologies.*

3. Environmental Sustainability Criteria Development

a. Develop a minimum number of specific, measurable criteria that will meet the goals of Environmental Sustainability, starting with the Mission & Principles of Sustainable Biochar production/utilization document

   i. Agro-ecology/Soil Management

   ii. Water Use Management/Conservation

   iii. Integrated Waste Management

   iv. Species Diversity

b. Select best metrics used in other standards that measure these criteria; and clarify what we want to measure if existing metrics aren't adequate.

** Consider time-scale, macro factors (cumulative effects of Biochar production/utilization practices), and impacts of existing and emerging technologies*

4. Reference Library

a. Develop Glossary of Terms
b. Build Standards Comparison Database
c. Collect and assess quality of metrics from existing standards
d. Collaborate on field trials network
e. Biochar Characterization Database

5. Structure and Process of Standard Development

a. Make recommendations on stakeholder engagement
b. Make recommendations on collaboration with other efforts
c. Make recommendations on modular standards development Planning (including crop-specific and supply chain modules)
d. Make recommendations on Certification & labeling
e. Discussion of ***thresholds for sustainability and inclusivity/exclusivity of standards***
f. Discussion of ***co-existence of different kinds of producers***
g. Discussion of ***what constitutes scientific evidence***
h. Biochar production/utilization management plan

6. Regulatory Interface and Policy

a. Government compliance; where does Biochar fit?
c. Department of Agriculture (USFS, ARS, NRCS…)
d. Department of Energy
e. Department of Defense? (food/energy security)
f. NGO's (which ones to engage with)
g. Producer Incentives and rewards
h. Discussion of how standards will affect other sustainability efforts around the world

7. Fundraising and Outreach

a. Public outreach and education (including reaching out to groups that have opposed the process)
b. Develop criteria for seats on Standards Committee (Set criteria for making these decisions)

8. Inputs and Technology

a. Provide information from input companies that is relevant to standards development
b. Provide and develop open source/traditional/non-patented techniques of production
c. Technology oversight
d. Discuss Precautionary Principle

9. Community Issues – *Incorporate into social criteria as appropriate*

a. Energy security
b. Food Security
c. Rural Infrastructure
d. Intellectual Property
e. Product Safety and Quality
f. Small-to-medium scale
g. Corporate Concentration
h. Rural communities- including quality of life and local hiring etc.