BIOCHAR: Funders Briefing Call Notes
December 1, 2009
10:00 am PACIFIC / 1:00 pm EASTERN

Cecily Kihn: Agua Fund
- Welcome and overview of speakers

Debbie Reed: International Biochar Initiative
- I will talk about:
  - What biochar is and isn't
  - Production aspects
  - Who IBI is and what we are doing

What is Biochar
- IBI's current definition of biochar (undergoing peer review)
  - *Biochar is a carbonaceous solid material intended as a soil amendment, obtained by thermally degrading (renewable) biomass in the presence of little or no oxygen*
  - Basically, heating biomass in the absence of oxygen
  - Intentionally created as a soil amendment
- Biochar is spectrum of materials and the product can range from high to low quality
  - Important to keep in mind, *Not all charcoal is biochar*
  - Right now, anyone can sell a charcoal product and call it biochar, even though it may not be

Biochar Production
- Most important determinant of biochar quality is how you produce it
- Produced with low-tech technology called pyrolysis – which is thermochemical decomposition of organic substances by heating
- The quality of biochar is determined by feedstock and production parameters, such as temperature (e.g. how long and how fast you raise the temperature)
- Low quality biochars can contain a lot of ash – but the ash is not biochar
- When you produce biochar you also co-produce energy
  - Synthetic gas or bio oil or thermal energy depending on technology
- There is a tradeoff between biochar produced and energy produced and different production techniques can produce different bio-energy, in differing amounts
- Three common production techniques
  - Slow pyrolysis – produces the most amount of biochar and least amount of energy per unit of feedstock – about 50% of feedstock carbon can become biochar
  - Fast pyrolysis – falls in the middle of biochar vs. energy production
  - Gassification – least amount of biochar and most energy per unit of feedstock

- New technologies are coming on line but no current results or analyses
- Will be different uses and application for the different technologies
    - More opportunities for application of gasification technologies in on-farm distributed generation systems, for example, because gassification is the simplest process
- Technologies are scalable, but it is more difficult to scale up slow pyrolysis
    - Currently there are no large scale, slow pyrolysis facilities – only prototypes
    - There are some large scale fast pyrolysis facilities, but these facilities are not producing biochar as the main product; energy is main product
- Biochar production facilities are/must be designed specifically for the location, purpose, and feestock used
    - While many commercial companies are working on the making a production unit that could be used anywhere, this is unlikely in near future
    - Over time specific units will be developed for specific settings/feedstocks, but we will probably not see mass produced or 'turn-key' facilities for use in the near term
- Modern biochar production facilities–as compared to ancient production or open-air, back-yard kiln production–are focused on reducing/eliminating negative impacts of production such as air pollution

Science of Biochar

- The science is moving very rapidly
    - 3-4 years ago only a few universities were engaged and now over 30 universities are working on R&D or other aspects of biochar
- Science has shown benefits of long-term carbon sequestration
    - The stable carbon in biochar has a mean residence time of 1,000-2,000 years when biochar is added to soils
    - Lower quality biochars may not have the same residence time
- Biochar has two carbon components, a stable recalcitrant portion and a more labile portion of carbon
    - The labile portion goes back into the atmosphere in a couple years
    - The recalcitrant portion stays in the soil for thousands of years
        - IBI advocates for carbon sequestration credits for only the recalcitrant portion
        - It is possible to test biochar to determine the recalcitrant vs. labile portions and determine the length of time the recalcitrant portion will remain in the soil
- Biochar is stable for long periods of time because the pyrolysis process physically changes the carbon structure of the molecule, which is what makes it useful for carbon sequestration
    - We are interrupting the normal carbon cycle by transforming some carbon into the stable form

    - The carbon would have gone back into the atmosphere in a shorter amount of time if it weren't for physically changing the structure of the carbon; you can see the physical changes by looking at biochar through an electron microscope
- Biochar has other positive impacts in soils
    - It acts like a catalyst – chemical interactions occur on the surface of biochar but biochar itself is not consumed
    - It is very porous if you look at it under a microscope - The porous nature is what gives biochar many of its positive properties in soil with biochar–even compared to adjacent soils no amended with biochar
        - It holds water and nutrients
        - It hosts unique beneficial microbial communities
            - Cornell is doing research on microbial communities in biochar and showing very unique beneficial microbes in soil with biochar
        - Reduces nutrient leaching of nitrogen and maybe phosphorus
        - Makes nutrients more bio-available to plants
        - Reduces soil nitrous oxide emission, which is a big deal for greenhouse gas reduction
    - Biochar is not a fertilizer but can reduce the need for fertilizer inputs
        - It is a soil amendment
        - Works best when applied with fertilizer, compost and/or inoculants of microbes
        - Offers similar benefits of compost or organic matter additions to soils, but offers benefits above and beyond

Criticism of Biochar

- Some claim biochar is the silver bullet for combating climate change, but this is not the case
    - Biochar is one tool in the toolkitto combat climate change
    - Not going to win climate change fight without changing how we produce and use energy
    - Because biochar adds resilience to soil it can be considered a climate adaptation strategy as well as a mitigation strategy
- There remain significant R&D needs for production and utilization
    - For example, determining what biochar is appropriate for which soil is a big research area
- There are concerns that biochar feedstock will compete for land resources like biofuels have;
    - IBI advocates using waste materials for feedstock, not planting specifically for biochar production

Who is IBI?

- We are a non-profit. We gained 501c3 status in August of 2007

- Initially we were working on focusing the R&D agenda between multiple players and basic information sharing activities
- Now there are lots of pockets of activity, a growing commercial interest, and significantly more research happening
- Now we see a significant need for standards, classification, and certification of biochar, both for the product and production systems
- We are philanthropically funded now, but will be moving to membership based financing
- Standards are our big push currently
    - Right now anyone can sell anything that is charcoal and call it biochar
    - There have been some commercial activities that have raised red flags
    - You may have heard of the Mantra ponzie scheme
        - Mantria came to IBI a while ago saying they had a great product and a great system
        - IBI asked to see the product and test it or get lists of their costumers buying the biochar material or their systems, but Mantria refused consistently, so IBI was already concerned.
        - Additionally they had large amounts of money they were throwing around, which is very strange in any new technology field, while others are struggling
        - We had no idea about the ponzie scheme

Stefan Jirka: Blue Moon Fund

- Blue Moon is a family foundation based in Virginia; Our focus is conservation and sustainable development through a climate change lens. The foundation works in Latin America, Asia, and the U.S.
- In Latin America we are focused on the Eastern Amazon and Western Andes
    - Our focus is on maintaining large tracts of tropical forest in tact for biodiversity, conservation and climate change mitigation
    - Deforestation in the tropics is often for agriculture
        - Starts on small scale, but then move on to new land due to loss of productivity
- We became interested in biochar as a way to enhance productivity on already cleared lands and to reduce forest loss
- We are supporting work in Costa Rica in the Osa Peninsula region
    - We have funded researchers to look at viable waste feedstocks from forestry and agriculture in the region. They are also looking at what's the most appropriate technology for the area. IBI has been involved on the consultation. Working closely with farming community through outreach and participation. Need to ensure there is a connection between research and field implementation

        - A pyrolysis unit was constructed and biochar produced for trials this last rainy season. Currently waiting on results that should come in the next few months.
    - Blue Moon will likely support this project for a number of years to monitor long term benefits in the soil
- Foundation is also working in China, which is a critical player in climate change. There are also major problems with agriculture: Runoff, eutrophication, burning of crop residues and air quality, etc.
    - Foundation is funding many projects looking at spectrum of technologies: Small scale-low tech in rural area where there is much demand for cooking fuel; Large scale-high tech development of mobile pyrolysis unit for flooded areas used for rice production; Looking to see if rice straw can be converted into biochar for soil amendments onsite and use of the liquid energy produced
- Foundation has also funded smaller work in the U.S. for R&D.
- The upshot of Blue Moon funding biochar is that it hits on many of the themes we are interested in
    - Sustainable development – energy production from materials on hand
    - Climate change mitigation from amendments to soil
- Lots of research on-going, Blue Moon is making link between science and on-farm implementation

Jamie Dean: David and Lucile Packard Foundation

- I work on the Agriculture Subprogram under the Conservation and Science Program; goal is to improve the environmental performance of agriculture and specifically reduce GHG emissions and nitrogen pollution
- Our biochar work is U.S. based and International. We have been giving grants in this area for about 1.5 years; first biochar grant was to IBI. Biochar is not at the core of any strategy focus but we are optimistic about it and will keep funding for the foreseeable future.
- We were primarily interested for the carbon sequestration benefits but now we are also interested in the other benefits including those when biochar is produced from waste – dealing with problem and creating biochar.
- Biggest concern is companies planting feedstock for biochar production; Really want to focus on using waste products. Want to avoid issues like competition for land that biofuels got into.
- Additional research is needed
    - We see a need for research into slow pyrolysis on a large scale basis
- Grants have been made to: IBI; North American biochar initiative; and a small grant to a group to increase conversations on international level
    - We are focused on supporting information sharing, classification, research and demonstration, and creation of sustainability standards; Packard does not fund projects like Blue Moon.

Question & Answers

1) Ted, OFRF: *What are suitable feedstocks, waste? Other biomass? What's feasible?*
    - IBI focuses on only waste feedstock
    - But any carbon biomass can be used
    - For optimal production you need a moisture content of 10-15%
    - Unless you're drying the feedstock first, drier feedstock is better
    - Also, some feedstocks have better nutrients for use in the soil
- Are we talking about garbage? Or lumber waste?
    - Lumber waste
    - Animal manures are good
        - Wet manure needs to be dried
    - Household greenwaste – lawn clippings
    - Technology of pyrolysis currently is specific to the feedstock rather than one size fits all

2) Cara, EPA: *I'm a little worried about using waste? I understand organic waste and animal manure, but when looking at other technologies, how safe is biochar produced from waste? If the product is going to be used on food for consumption how do we ensure safety?*
    - There are very few regulation for soil amendments right now so yes this could be a concern
    - That is why IBI is most concerned with standards
        - We don't want to utilize any waste that might have heavy metals for instance
        - Those are the sorts of issues that aren't addressed right now
    - We believe we should never give credit for GHG offsets or reductions unless a full life-cycle analysis has been done so that credit isn't given to things that don't deserve it
        - Strong need to look at the full cycle emissions of systems

3) Ted, OFRF: *Is there an energy trade-off? If you're applying heat then your using energy?*
    - It is very important to analyze on a system by system basis – both the energy cycle and the economics
    - Right now if you're using waste that has to be transported, for instance, and you have to dry the feedstock, the economics won't work out
    - On the other hand, if you have feedstock in one place and you use the energy produced in the process to dry the feedstock – then the economics can work
    - There is just a strong need to look at full systems approach
    - No one is going to make money if people use more energy than is produced, or don't have a valuable biochar product
    - Have not seen good robust analysis of energy cycle and economics
        - Currently, a lot of commercial entities say that information is proprietary

4) Marion, Threshold Fdn: *It's hard to get free lunch out of nature. It seems if we want to come closer to getting truly green energy in rural places, it might be better to give them all solar cookers rather than going through biochar business?*

- Blue Moon in China is investigating potential for biochar producing cook stoves as part of a larger suite of renewable energy production for rural areas
  - Solar cook stoves wouldn't work during a large portion of the year in many places
- In certain parts of the world, yes better technologies, but co-benefits from biochar is something to keep in mind

- Also if you take agriculture waste of other waste away from the land and turning into charcoal, might "rob peter to pay paul"?
  - Crop residues are often not returned to the soil because of waste management problem for farmers
  - At least by putting part of material back into soil not everything is lost
  - Also, the increased fertility can make biochar better for the soils than simply leaving the crop residue
  - There is a breaking point on how much material you ever want to take off the soil
    - Some amount of residue is necessary for erosion control and other processes
  - But yes, if biochar isn't put back into the soil from which feedstock or crop residues were removed, then need to consider how much you're taking about of the soil ecosystem
  - Current systems are not using organic waste, and using too much fertilizer, so biochar can hopefully reduce that fertilizer need and put some of the organic waste back into the soil

5) Maria, Grassroots International: *We support many small farmers who are trying to move away from synthetic fertilizer, is IBI looking at only large-scale production or also look at smaller scale systems?*

- IBI is looking at both developed and developing countries applications
- Much of our developing country work is joint with the UN Convention to Combat Desertification (UNCCD) which is looking at dryland uses of biochar, and often working with small-holder farmers
  - We do have some very good small scale and small holder projects in developing countries
- Seeing more and more small scale companies working in developing countries
- Enabling small scale/developing country work is about half of what IBI does
- Blue moon is looking at both small and large scale as well

- In US high-tech approach, there is a project in western Massachusetts, and there people were concerned with land use and cutting old growth forests, etc.?

- I don't know about the Massachusetts project specifically, but I would be very surprised if people were using old growth forests to produce biochar
- Blue moon is looking at using poultry litter for biochar production
  - There are very large and intense poultry operations in the Shenandoah Valley which creates massive pollution
- We are definitely **not** advocating that any land is converted or native vegetation is used
  - Want to focus on waste that is under-utilized now

6) Cecily, Agua Fund: *How extensive is the area where field work is done?*

- Stefan – to date most our work is in Costa Rica in the Osa Peninsula, which is about the size of three or four average U.S. counties
  - There is a core farming communities
  - Some farmers are in cooperatives
  - Most farms are a hectare or less
  - We are starting with demonstration – e.g. the rice that was produced with char outperformed the field next door that didn't use biochar, etc.
    - We are hoping this will scale up
- In China the projects were initiated very recently
  - There is a heavy focus on R&D and energy production
  - Field scale farm production for the first season – small scale
  - For the rural cook stoves work we are working with Global Environmental Institute in two provinces, Sichuan and Hunnan

7) Greg, Cedar Tree Fnd: *Where do things stand is terms of developing standards and what kind of timeline do you expect?*

- IBI started developing biochar standards approximately 1 yr ago
  - At first we looked at how to put a grade or quality rating on the product; now we are focused on entire biochar systems
- We also began work to develop sustainability standards for feedstocks
- The draft standards are being circulated and have been for about 4 months.
- Within a year we expect to have the standards out to a greater audience for review – and would start certification work
- The standards for materials will take less than a year
- The standards for feedstock/production will be about a year