

## Biochar Field Trial at Goddard College

**Project Proposal** by Nancy Kellogg  
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### 1000 sq. ft. of sunflowers in ten 5 x 20 foot beds

Biochar use in soil is a new strategy with many unknowns and uncertainties. Research on biochar in different types of soil is needed. IBI encourages field trials, and shares results with the public.

Biochar use is accelerating, especially in Vermont, where Biochar Northeast is headquartered. Two Rivers in Montpelier plans a June 5 grower workshop. Carbon credit for biochar sequestration is being discussed in the US, already set in New Zealand and Australia. Legislation is advocated in VT to offer biochar offsets.

This sunflower test will use IBI field trial guidelines to compare combinations of biochar, compost and inoculants, and effects on plant growth. Quantitative results will be measured, documented and submitted to IBI Field Trial Registry.

This trial is Goddard's opportunity to contribute to the biochar movement, bring biochar to the mainstream, and "walk our (sustainable) talk." Eventually, Goddard can use biochar carbon credits to offset its 100,000 tons of annual emissions.

With volunteers, I will guide this research from soil tillage to completion. A Goddard campus review found a site near the greenhouse. Next year this will be choice plots to expand staff gardens.

Facilities personnel will skim sod off 1000 sq. ft. so beds can be plowed. Manuel O'Neil (Goddard Financial Aid) offered a tiller for the beds' final pass. Seeds solicited from High Mowing.

Biochar and compost will be donated or sold by local sources, including: Ideal Compost (Peterborough NH), New England Biochar (Cape Cod MA), Vermont Biochar (Danville).

Soil tests will be by Crop Services International in Michigan, using Reams and Albrecht test methods.

## Slabwood Barrel Burner

by Chip Chapman  
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With ideas and advice from Doug Clayton and Dr. Hugh McLaughlin, Sang and I made a simple retort furnace from a 275-gallon fuel oil tank and two 50-gallon barrels. Simple design, but labor intensive. As of April 24, we have run two successful batches. We whittle away at my slab piles each time we use it, and are getting better results as we go.

The first run was not quite hot enough so we used some of the questionable char as fuel in the firebox for run 2. Second batch appears to be just right and passes a handwash test: all the black washes off my hands with just water. My old stickers, slabs and edgings make that sweet plink-clink sound when they snap apart effortlessly in my fingers.

Whether we enlarge this, or run a series of them remains to be seen. This is our way to get biochar in the ground this growing season here at our farm. We're working with neighbors on a communal garden and will try some there.

Using chips for feedstock is still the only real answer for me, because it eliminates so much handling, and means the crushing is mostly done. To have char already uniform in small pieces is a boon, and much easier to load the pyrolysis chamber.

### James "Chip" Chapman

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## Keystone State Biochar

In southeast PA, BNE Board member Dale Hendricks is an effective teacher and steady advocate. Late last year, he made a 2-barrel burner to make biochar for his gardens—and a Youtube video.

In early February, Dale taught biochar at PA Assoc. for Sustainable Agriculture (PASA), and at the end of the month, staffed a BNE booth at the Ecological Landscaping Assoc. conference. Dale is learning nutrient-dense food production methods to build soil fertility and biology.

Saturday March 20, Mark Highland of Organic Mechanic Soil Company hosted a biochar day in Modena, PA from 1-4pm. Mark runs a certified organic potting soil company, and is keen to add biochar to his soil mixes. He spoke on biochar history, production, potential, and use in soil, then demonstrated his new 2-barrel nested retort. 25 people from eastern Pennsylvania made the day a success, had many questions and lively discussions. Dale Hendricks helped out, demonstrating his 2-barrel retort and Toucan 1G TLUD to make biochar from wood pellets.

[www.organicmechanicsoil.com](http://www.organicmechanicsoil.com)

book review by Frank Kaminski

## The Biochar Debate

### Charcoal's Potential to Reverse Climate Change & Build Soil Fertility

by James Bruges

Chelsea Green Publishing. 120 pp, Jan. 2010.

[www.energybulletin.net/52714](http://www.energybulletin.net/52714)

It's called biochar, and if you believe its ardent supporters, this unassuming, fine black powder is a vital tool to solve some of humanity's most urgent ecological threats, including climate change, peak oil, soil degradation, and water pollution due to agrochemicals.

Geared to lay readers, **The Biochar Debate** begins by succinctly summing up climate change, peak oil, peak phosphorus, and other important issues about the Earth's ecological limits. It describes biochar science, its fascinating history, weighs merits against pitfalls, presents a compelling case for its immediate, large-scale use, and discusses pilot plans that are underway to date.

All in all, **The Biochar Debate** is a spirited yet critical look at a controversial emerging technology that can potentially mitigate climate change, restore depleted soils and improve future food security.

Adam Retort

## Shelburne Farms Experiment with Biochar to Clean Water and Revitalize Soil

by Ken Picard, *Seven Days* VT  
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Marshall Webb is used to getting his hands dirty. After all, he is woodlands manager at **Shelburne Farms** sprawling agricultural estate on Lake Champlain that's been in his family for generations.

But his latest project, handling charred lumber, isn't as messy as you'd expect: A ton of "biochar" is remarkably clean, and holds the promise of purifying polluted water, revitalizing damaged soil, generating clean energy, even saving the planet from global warming, say scientists experimenting with the blackened wood.

"The problem with biochar is the potential is so great and exciting people tend to exaggerate what's known of it," Webb admits. "But, according to many people, biochar is a key discovery to enable humans to survive in this century."

What is this miracle material?

Seated in his silo-shaped office in the north tower of Shelburne Farms' farm barn, Webb drops a couple of discs on the table and explains. The first, he says, is a greenish-brown hockey puck made of pressed switchgrass that was grown in Pennsylvania. The second, slightly smaller disc is the charred and friable remains of that same switchgrass after it's reduced to elemental carbon by heating it to 1000 degrees F in absence of oxygen.

Webb picks up the second disc, which crumbles easily in his hands. Surprisingly, his fingers don't get very dirty—a good sign, he notes. Unlike blackened remains found in a barbecue or fire pit, biochar contains few, if any, of the toxic byproducts left by incomplete combustion at lower temperatures.

Next, Webb explains how biochar is made. He takes out a contraption made from a coffee can stacked on a paint can with holes punched in the top. The paint can is filled with wood pellets, or any other biomass, and a fire built in the top. As the fire burns down, it "pyrolyzes" the biomass, releasing gases such as hydrogen and methane, which are then burned off. What's left in the makeshift retort is biochar, as well as bio-oil to use as fuel.

Several weeks ago, Webb, along with two researchers from Cape Cod, spent the weekend at Shelburne Farms with a much

larger version of Webb's coffee-can contraption making four 500-pound batches of biochar; they used scrap lumber left over from a saw mill. Webb sold a bag of the stuff to a man across the lake in New York who wants to do his own experiments with it. The rest Webb gets to keep at Shelburne Farms.

His plan uses **environmental studies students from UVM** to put several biochar filters in a nearby stream that empties into Lake Champlain. The students will test water above and below the carbon filters to see how effectively they remove phosphorus, nitrogen and *E. coli* bacteria, all pollutants that run off the farm and deteriorate water quality. If everything goes according to Webb's expectations, biochar filters should capture these pollutants much the way an activated charcoal filter does.

Next, Webb plans to take those nutrient-saturated filters and add them to test plots in Shelburne Farms' vegetable gardens. This not only returns nitrogen and phosphorus to soil, where it can be absorbed by plants; biochar also retains moisture and provides a fertile environment for billions of microorganisms necessary for healthy soil.

"A side benefit is that the carbon is sequestered for a thousand years," Webb adds. "It doesn't break down or go away."

Although "biochar" is a new term, as are its uses for environmental management, the idea has actually been around for centuries. Pre-Columbian Amerindian populations added a version of biochar to the soil in the Amazon Basin to increase its fertility. It was named *terra preta de Indio*, Portuguese for "Indian black earth," which historians believe

may have contributed to the development of complex civilizations in that region.

In the last 200 years, agronomists world wide also recommended adding charcoal dust or similar char to soil to retain moisture, boost soil chemistry and improve seedling growth. However, only recently have researchers begun to recognize the vast potential of using biochar to lower greenhouse gases, generate heat and revitalize soils damaged from decades of logging or overfarming.

For his part, Webb says if biochar lives up to its much-vaunted potential—Bob Wells from Cape Cod's Redberry Farm increased the output of his farm by thousands of dollars per acre, he notes—Webb would eventually like to build an oven at Shelburne Farms to make biochar, which can also heat animal barns or other buildings, all in a carbon-negative system.

"A small but very passionate group of individuals are working on this," Webb says, manipulating a charred wood lump with his fingers. "I could be one of them."

### Shelburne Farms (continued from page 1)

nitrogen runoff of farm fertilizers and manures. Charcoal use for water filtering is well understood. Biochar greatly increases soil's filtration capacity as a sponge and delivers cleaner water.

Saturday many folks attended a demonstration of the retort, including Shelburne Farms staff, local farmers, UVM students and faculty, and BNE board members. Local TV and press covering the event interviewed BNE Vice President Jock Gill, Bob Wells and Marshall Webb (see page 6). Sunday, BNE's Board met in the education center.



Adam retort, used for making biochar at Shelburne Farms