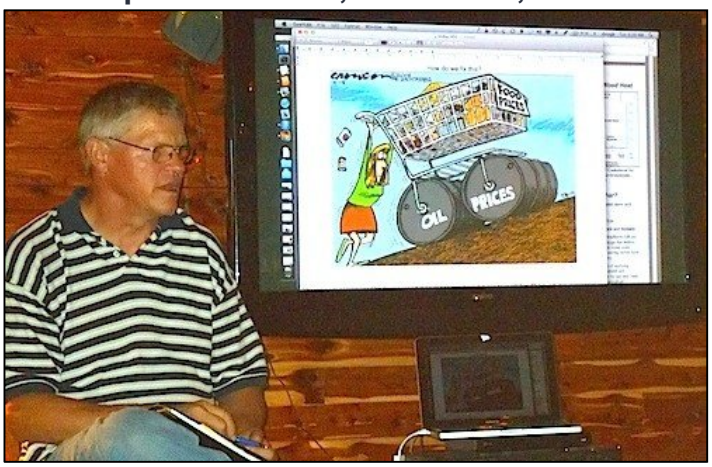
Biomass Energy
ELECTRICITY FROM WOODGAS
Biostove & Bioenergy Camp
Woodpecker's Farm, Theodosia, Missouri



Community Resilience activist Doug Brethower hosted his first **Biostove & Bioenergy Camp** June 2-6 at Woodpecker's Farm, northeast of Theodosia in southern Missouri. For five days, 11 men studied & talked, learned gasification & combustion, air flow & updraft, built stoves, and shared enthusiasm for technology to obtain renewable bioenergy, biochar & soil fertility from abundant local, sustainable biomass.

In 2012, Doug Brethower bought Alabama woodgas wizard Wayne Keith's 1954 Ford pickup (red above), powered by Keith's home-built, hand-made gasifier system. Doug is rebuilding many of the trucks mechanical & electric systems, and upgrading the gasifier with digital controls. Wayne now has a website and book detailing his ideas and experience with woodgas conversion:
www.driveonwood.com

Monday, June 2

After Monday morning discussing bioenergy, BTUs, biocarbon chemistry, and air flow geometry, the men built small cookstoves out of soup cans. Attendees fashioned unique biostove designs from what Doug calls "obtainium tincanium"—as in the ***Avatar*** movie. A skilled, talented, motivated heads-up

group presented design innovations and learned much from each other.

Tuesday, June 3

The most exciting event was in afternoon, when—led by Alfred Denninger (dark t-shirt, center)—the team connected a 4 kilowatt electric generator to his 5-gallon "simple-fire" gasifier he fabricated, based on Gary Gilmore's char-gas design. The group swarmed to get everything hooked up. Final assembly began about 2:30, and the generator was running on char-gas by 3:30. Youtube video of final assembly:
https://www.youtube.com/watch?v=wzQWBbCQ18s

The gasifier was filled with charred wood pellets,

and stoked to a fierce yellow-hot burn with a shop vac. Charred hardwood pellets were made while cleanly firing volatiles to cook meals. Charcoal has so many uses, there's no such thing as too much char. Making char small scale allows the heat energy released to be used wisely, instead of wasting it.

To remove impurities, gas released by char gasification is piped through a simple home-made air filter consisting of wire screen coiled inside a metal cylinder. Char-gas is then piped to the generator air filter and carburetor. In photo below, hot char-gas enters on left; exits to generator on right. Fresh air intake is hole at bottom center, showing yellow-hot charcoal fire inside. Black hose at top is char gas supply to filter and generator. Silver hose with shut-off valve on lower right is generator exhaust return.

A third pipe returns generator exhaust gases to the gasifier. In the top right photo, the 5-gallon gasifier (top view) burps a small gas flare out the fresh air intake. We stopped when the temperature on the gas outlet fitting climbed over 120F—the "comfortably

hot to the touch" range.

After a little fine-tuning to adjust the air-fuel ratio, a 5-gallon metal bucket full of char was powering a 4,000 watt generator. For 38 minutes, the gasifier delivered combustible "char-gas" to the generator while consuming under a quart of hardwood pellet char. A tool grinder, then a freezer chest on the porch provided load on the generator for testing. It worked well, and was, indeed, simple. After the air/fuel ratio was set, and Richard and Mark fixed a broken pull rope, Al got the generator to fire on char-gas on the first cord pull!

At the least, this gasifier & generator can supply electricity in an emergency power outage. Or it can be scaled up to larger size and used to generate on-site, off-grid power for a farm, sawmill or other business. This technology can be scaled up further to provide power for a rural community.

Wednesday, June 4

Wednesday morning, David Yarrow talked for 3 hours on using biochar in soil. An amazing session to preview David's 1-day training in "**Carbon Smart Farming**." If you haven't seen his presentation yet, keep an eye out for one of David's talks. He teaches

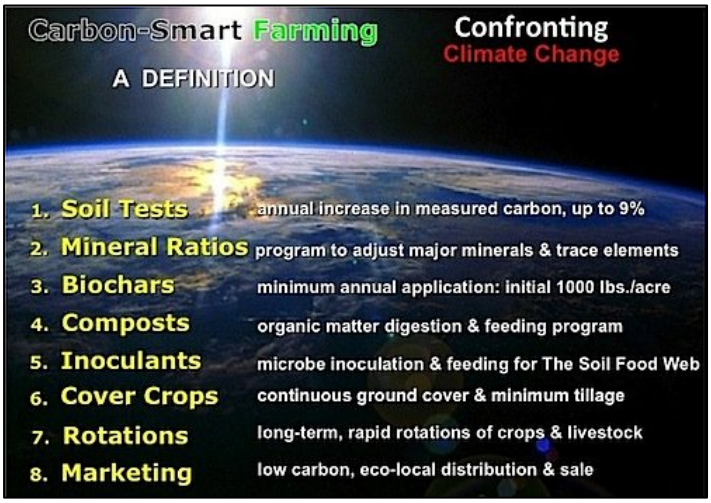
the big picture & small details, with highly refined illustrations, wisdom and insight on biochar's power to change the world's soils. David shared his insights all week. We're pleased he could join us!

Wednesday afternoon, teams of attendees began building four KeyStove GH heater & biochar kilns (lower right) from parts, and played more with Al's Simple-Fire gasifier and generator.

That night we dined out at the gorgeous, secluded Rockbridge Trout Hatchery & Restaurant. Trout fresh from the nearby stream is the house specialty.

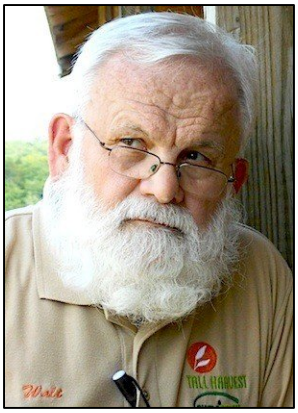
Thursday, June 5

The morning presentation by lifetime organic farmer & teacher Walter Gregory (middle right) described SummaGrow as a microbe inoculant for biochar and soil. After Walt, Phil Blom provided perspectives on challenges to start a business to make and market char, and difficulties to convince farmers to change and embrace new carbon-smart methods and materials. Then David Yarrow explained "**The 4 Ms**" to prepare biochar for soil use:



Moisten, Micronize, Mineralize, Microbe inoculate.

As David ended, the sky opened, winds whipped into a mini-hurricane as a dense curtain of nearly horizontal rain.



After lunch, the group teamed up to build four Keystove XL greenhouse heater & biochar kilns like the one that powered Doug's TLUD woodgas cooktop. The design allows two heaters to provide 24x7 cooking while making biochar. With two biochar burners, cooking power is rotated by sliding one kiln out, then the second one into place.

Friday, June 6

This was Community Day for participants to share what we learned and accomplished with wonderful people in the community around Theodosia. The amazing Simple-Fire gasifier-generator running on clean energy from biomass was, of course, a big hit. Many lights lit up in most minds. Doug's favorite comment of the day was, "I've been looking for this for 30 years, and here it is, right in front of me, today!"

After lunch, David Yarrow gave a brief talk on carbon-smart strategy and using biochar in soil to gross superior, nutrient-dense crops while sequestering carbon to reverse global warming. The day ended with Doug auctioning off Terra-char, SummaGrow and 30-gallon greenhouse heater to raise money for the next biostove camp.

This was a great first-ever camp. Endless thanks to the extravagant hospitality provided within this community, and the powerful hearts and minds of camp attendees.

Thank you!

- all attendees and local community
- Mike Wood of Woodpecker Farm for a great facility
- Jon Kruger, who organized the event
- Jewel Kruger who fed us eco-local fresh food
- Phil Blom of Terra-Char for making biochar
- Phil Blom donated tote of char to the auction
- Walt Gregory for his SummaGrow wisdom
- Wayne Keith for his generous sponsorship.

Saturday, June 7

Inspired by his successful 5-gallon gasifier, Alfred Denninger (center) will tackle a new, bigger challenge. Al bought a 1993 Dodge Dakota pickup truck—an ideal model to convert to run on woodgas. His next fabrication project is to build a complete gasifier system to power the Dakota pickup. Al's larger, more complex gasifier to power his new pickup will be based on designs by woodgas wizard Wayne Keith, detailed in his new book "***Drive On Wood***". Wayne Keith converted 9 pickups in the last decade to run on woodgas (above):
www.dyarrow.org/woodgas

Mother Earth News video of 84 mph on woodgas:
www.youtube.com/watch?v=JlNACAEa3vo

More Good News!

Several of us from camp will get together again soon in Thayer, MO at the **Go Green Festival** June 21 & 22. Contact Mike Slack for info on the event:
mike65807@yahoo.com.

Thanks to the success of this first Bio-energy camp, another is planned for next year, one week later in June. For more information, or to schedule a camp for your community, contact Doug Brethower at
freedombiomass@gmail.com.

David Yarrow returns to Woodpecker's Farm Saturday, Oct. 18 to teach a 1-day "Carbon-Smart Farming" training program:
http://www.dyarrow.org/CarbonSmart