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News / Environment

Primitive soil nutrient might carry one solution to climate change



Doris Hamill talks about Biochar. Biochar is an organic charcoal that has an incredible range of environmental benefits - removing heavy metals from soils, enriching farmland, filtering groundwater, sequestering carbon from the carbon cycle that causes global warming. Monday, Jan. 8, 2018.

By **Tamara Dietrich** · **Contact Reporter**
Daily Press

JANUARY 16, 2018, 8:00 AM

Over many centuries — perhaps millennia — primitive peoples plowed biochar into farm fields, turning poor soil into rich cropland.

In fact, it's such a miraculous soil amendment that 20 years ago researchers found that biochar applied in the Amazon basin more than 500 years before is still enriching soils there.

"It hadn't broken down, it hadn't rotted or degraded or anything," said Doris Hamill, a physicist at [NASA](#) Langley Research Center with a deep interest in green technologies. "And that made people say, 'Hmmm, you know, if biochar can be put in soils and not break down for hundreds of years, this could be a real solution to global warming.' "

That's right — global warming. That's because an added benefit of carbon-packed biochar is that, by plowing it into farm fields, it removes the greenhouse gas carbon dioxide indefinitely from the carbon cycle.

But that's not all.

Biochar can be made from common organic waste material — from chicken and cow poop to sticks and brush from your yard. It can make environmentally unfriendly synthetic fertilizers obsolete. It can trap nutrient runoff before it pollutes places like the Chesapeake Bay. It can even filter out toxic heavy metals from water.

"It's an environmental superstar," Hamill said. "It's global warming, it's soil fertility, it's sustainable agriculture, it is protection of groundwater — it just does everything. It's really kind of amazing."

For Hamill, biochar holds vast potential for improving the human condition, and she's set to delve into all of it in a free public lecture Tuesday evening at the Virginia Air & Space Museum in downtown Hampton.

She's scheduled to appear at 7:30 p.m. as part of NASA Langley's Sigma lecture series.



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'Soil reef'

Biochar is essentially charcoal but made out of all manner of biomass, not just the wood chips typically used to make charcoal.

It can be made using materials as simple and cheap as metal cans. Hamill has made biochar in her driveway using steel barrels, for instance, schoolchildren make it for class projects, and Third World households make it routinely in small amounts using something called a "rocket stove" — despite the name, a device so low-tech it can be made from a couple of soup cans.

"A lot of primitive people — think of a housewife in India, for example — have been burning fuel in the center of their houses and produce all kinds of smoke, and it's terrible for people's health and is not terribly efficient," Hamill said. "Somebody came up with a little stove that creates biochar, called the rocket stove. And it produces a very clean energy and also biochar, and it completely solves the problem of the air pollution inside the house."

Biochar produced from cooking a meal can get tossed in the household latrine, where it acts as a filter and deodorizer, and then eventually used as a garden fertilizer.

Hampton master gardener Rhonda Graves likens biochar to a "soil reef," much as an ocean reef provides habitat for a vast population of critters.

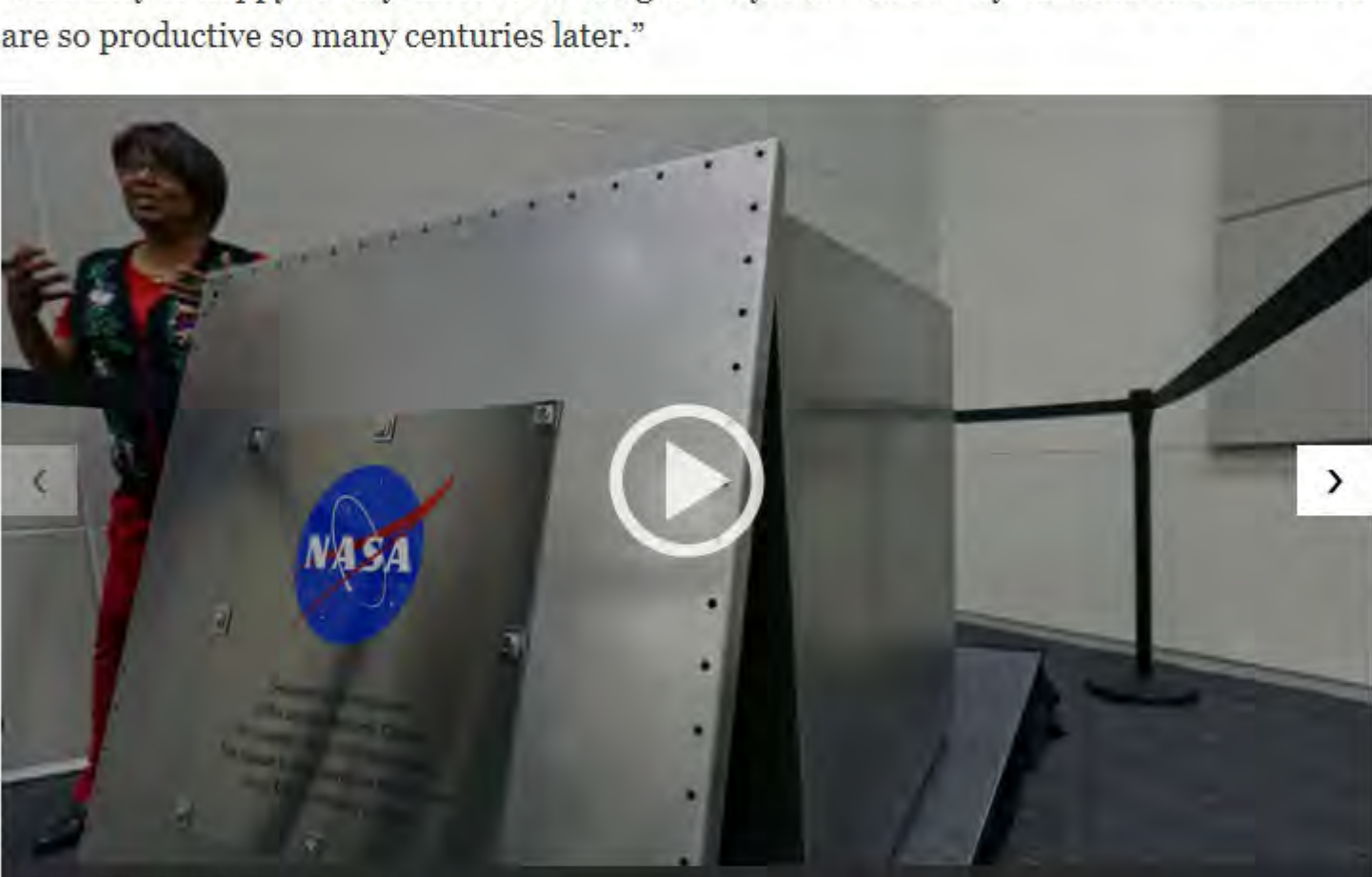
"It provides habitat for all the microbes that are in the soil that we don't even think about when we garden or farm," Graves said. "As you build up that biochar in the soil, it really just gets better because the microbes just have a healthier place to live."

Graves has been interested in biochar since she first heard Hamill speak on the topic nearly eight years ago.

If you really want to do it right, Hamill said, mix your biochar with compost to create a "living fertilizer."

"That supercharges it," Hamill said. "Sometimes we speak of it colloquially as a carbon condominium — it's a wonderful place for the soil microbes to live in; it keeps them moist, it keeps them safe from predators."

"And they're happy to stay there for as long as they can. That's why the soils in the Amazon are so productive so many centuries later."



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Water filter

While biochar can remove carbon from the carbon cycle, Sandeep Kumar is researching its ability to filter nasty heavy metals from water.

"What I have shown is that biochar can remove lead from water, cadmium from water, uranium from water — all these metals can be removed by biochar," said Kumar, an associate professor of civil and environmental engineering at [Old Dominion University](#) in Norfolk.

A low-cost biochar filter could be a particular boon to communities such as Flint, Mich., that are plagued by lead contamination in drinking water.

In fact, Kumar and a team of students have just embarked on a yearlong \$15,000 project funded by the U.S. [Environmental Protection Agency](#) to develop just such a filter, inspired by the Flint crisis

"It's not a high-tech process to make the filter and test it," Kumar said.

The project is part of EPA's People, Prosperity and the Planet (P3) national student design competition to develop ideas for a sustainable future. ODU is now one of more than 40 universities across the country vying for a P3 phase II grant of up to \$75,000 to implement their idea in a real-world setting.

Get the bug

For all its potential, biochar is generally little-known, underappreciated and woefully underutilized, Hamill said.

"There's just no scientific reason that we shouldn't be doing this on a very large scale," Hamill said. "The only reason has got to be economic. People just haven't figured out a way to make it economically feasible."

According to the International Biochar Initiative newsletter, China is beginning to invest heavily in biochar, "primarily to reduce air pollution, improve yields and soil fertility and sequester carbon."

China is building about 50 biochar plants and has tested biochar fertilizer in more than 300 field sites "with impressive results." Last year, it converted 200,000 tons of crop residues to biochar and expects to convert 800,000 tons this year.

But such national investments are unique.

For personal use, rocket stoves and biochar are available commercially, and a bit of Googling shows how to tackle a simple rocket stove as a DIY project.

Graves is hoping a major grill manufacturer will develop a product readily available at home improvement stores.

"I think it could be wonderful," Graves said. "You could buy this grill and add your sticks, and at the end of the day, you've got biochar and you've had your dinner."

As for Hamill, she's hoping the presentation she delivers to her NASA peers Tuesday afternoon before her public lecture will serve as inspiration.

"We've got a lot of engineers here, and I'm kind of hoping that somebody will get the bug and start building stuff for his own amusement," Hamill said.

"Maybe somebody will figure out how to make units that can be sold commercially. I think that if units were available that people could use in their backyard for a couple hundred dollars, I think it would be all over."

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