



Energy and Bioproducts

PHOTO: USDA

Biochar—A do-it-all substance for reducing agriculture’s impacts on the environment

Agriculture and forestry can produce a lot of waste, including as manure, crop residue, and tree bark. Disposing of and treating these wastes takes time, space and money and can cause air and water pollution. To improve the economic and environmental sustainability of agriculture, scientists at land-grant universities across the U.S. are finding innovative ways to reuse agricultural and forestry wastes in novel materials made from biochar, a charcoal-like substance created by heating organic material. Research has shown that biochar can increase soil fertility, sequester carbon, and improve water quality by absorbing pesticides, antibiotics and other chemicals. Recent studies on biochar have yielded even more impressive uses:

Successful examples include:

- Researchers in **North Carolina** found that biochar made from miscanthus, wood bark and swine manure can be used as a raw material for low-cost, high-performing supercapacitors, which are used to store and release large amounts of electricity – much like batteries, but faster. Other studies showed that biochar-based materials can block ionizing radiation like X-rays and gamma rays. These materials could be used in protective gear.
- To treat raw sewage, wastewater treatment plants often use anaerobic digestion, in which certain bacteria feed on the sludge, but this method can be costly and inefficient. Scientists in **Alabama** found that biochar can speed up anaerobic digestion and determined the best way to produce biochar for optimal performance. Improving sludge treatment lowers costs for wastewater treatment plants, towns and taxpayers – and keeps waterways safe and clean.
- Researchers in **Arkansas** developed a cost-effective method for livestock farmers to convert animal byproducts like crawfish shells and chicken feathers into biochar that can be used to absorb or degrade

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Prepared by the National Impacts Database Communications Subcommittee, supported by ESCOP, ECOP and USDA/NIFA.

02/2021



National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE



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water pollutants. While plant-based biochar often uses costly chemical and metal modifiers to improve these abilities, animal byproducts have naturally occurring chemicals and minerals that can achieve the same level of functionality.

- Researchers in **Illinois** showed that biochar can be used to help livestock producers compost animal carcasses. Adding biochar may shorten compost times, prevent liquid from forming and seeping into the environment and reduce greenhouse gas and odor emissions from compost piles. Following Extension workshops, livestock producers are more willing to use biochar in animal composting and have gained more skills and knowledge to do so.
- Researchers in **Iowa** found that biochar made from red oak and corn stover can mitigate odors and other emissions from manure, reducing the adverse effects these emissions can have on the environment and on the health of livestock, farm workers and nearby residents.