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Biochar for Carbon Removal from the Atmosphere

In the October 21 issue of Nature Communications Woolf et al demonstrate that biochar could play an important role in removal of carbon from the atmosphere, which is increasingly recognized at essential to meeting global climate targets. Woolf compared biochar-bioenergy systems with bioenergy alone and gasification-based bioenergy with carbon capture and storage, known as BECCS. In its 2014 report, IPCC flags BECCS as the only major land-based approach expected to draw down atmospheric carbon dioxide. However, Woolf demonstrates that biochar-bioenergy systems that sequester carbon in agricultural lands could reduce carbon sequestration costs, allowing earlier adoption of a more aggressive policy of actively removing carbon from the atmosphere to avert dangerous climate change.

Biochar-bioenergy competes favorably with BECCS at lower carbon prices, and where biochar addition to soils delivers significant increases in crop yields. Thus, effective use of biochar as a carbon removal strategy relies on identifying those sites that are most responsive to biochar. This requires similar knowledge systems as those commonly in place around the world to guide fertilizer application. Averaged across all published scientific experiments, biochar increases crop yields around 20% with application rates often exceeding 10 t/ha. However, applications of less than 5 t/ha can increase crop yields by over 50% in certain types of soils. Even highly productive agricultural lands contain patches of degraded soils that would benefit from biochar application. Precision agriculture can deliver biochar to specific field locations where it can provide the greatest soil benefits.

Biomass energy in combination with carbon sequestration has enormous potential as a carbon removal strategy. However, biomass is a widely dispersed resource best suited to small-scale, distributed bioenergy systems. In contrast, sequestration of carbon dioxide is necessarily a large, centralized operation to enable separation and injection of carbon dioxide into carefully selected geological deposits. This mismatch in scale between bioenergy production and carbon dioxide sequestration is a challenge for gasification-based BECCS. The relative simplicity of producing and sequestering biochar results in biochar-bioenergy systems that can be built at modest scale and widely distributed. Their small size reduces the risk of deploying new technology, eases financing, and speeds adoption. Biochar-bioenergy systems can play an important role in a global strategy to actively remove carbon from the atmosphere.

This information is provided to the biochar community by the Board of Directors of the International Biochar Initiative.

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