

Biochar: “Triple Wins”, Livelihoods and Technological Promise

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Biocharred Pathways to Sustainability?
Triple Wins, Livelihoods and the Politics of Technological Promise

STEPS briefing 41

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About the STEPS Centre

The STEPS Centre (Social, Technological and Environmental Pathways to Sustainability) is an interdisciplinary global research and policy engagement hub uniting development studies with science and technology studies. We aim to develop a new approach to understanding, action and communication on sustainability and development in an era of unprecedented change. The STEPS Centre is based at the Institute of Development Studies and SPRU Science and Technology Policy Research at the University of Sussex with a network of partners in Asia, Africa and Latin America and is funded by the Economic and Social Research Council. Find out more: www.steps-centre.org

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Biochar is a carbon-rich product that results when biomass is burned under oxygen-deprived conditions. There is both technological optimism and debate about its potential. The addition of biochar to soils is being hailed both as a promising tool in carbon sequestration and enriching soils, and it appears also to offer a range of other benefits to farmers and the environment. This promise is

generating research, imagination, and investment that out-paces actual practices on the ground. Critiques are also emerging in an often politicised and polarised debate. What is being said about biochar and the promises it offers? What is missing? Could biochar become part of pathways to sustainability for small farmers in rural African settings and beyond?



Children collecting locally-created dark earth for planting in Zorzor district, Liberia. Photo: Victoria Frausin

Scientists, policymakers, NGOs and companies promoting the application of biochar to soil say that it offers an unprecedented 'triple win'. It simultaneously meets the challenges of:

- Climate change mitigation – The carbon in biochar resists degradation and can sequester carbon in soils for hundreds to thousands of years, offering a major route to draw down and lock up carbon from the atmosphere;
- Agriculture – Biochar enhances soils' ability to retain nutrients and water, making them more productive with less inorganic fertilizer, offering a valuable tool for a more sustainable agriculture;
- Energy – The pyrolysis (burning) techniques used to produce biochar can generate bioenergy, a low-carbon source of energy.

According to proponents of biochar, the technology thus offers development benefits to farmers in resource-poor settings, improving food security, climate change adaptation, and sustainable land use, and can even bring health benefits if produced in improved cooking stoves that reduce indoor air pollution.

“Biochar is being promoted as a 'multiple win' technology for small farmers”

Biochar is consequently being promoted as a 'multiple win' technology for small farmers in Africa and beyond. At least twenty trial projects are in place, and many others planned or promised. Meanwhile, biochar-related businesses are springing up, seeking to exploit the commercial potential of being 'green' in multiple ways, and the rich (if uncertain) rewards promised by emerging global carbon markets.

Critiques and uncertainties

Other researchers, commentators and NGOs are less optimistic. They point to various technical uncertainties about biochar, questioning its effects and longevity in soil and the potential impacts and sustainability of biochar systems. There are no large-scale, long-term experiments that study the effects of biochar in real situations.

The prospect of large-scale carbon sequestration fed by plantations of biochar feedstocks has been strongly questioned on grounds of technical and economic feasibility and sustainability. Biochar could not make a significant contribution to the global terrestrial carbon sink as the amount of land that would have to be used for it is too great, given the competition for land use.

“Biochar is no 'magic bullet' for the complex challenges of climate change and sustainable agriculture”

Biochar production could also take over land that might be used for food. Several NGO and government critics have suggested that commercially-driven biochar applications will lead to 'land grabs' (or 'carbon grabs') in developing countries, displacing farmers and undermining food production. Their arguments echo the earlier debates over 'biofuels versus food'. Meanwhile, biochar projects risk imposing external technologies in a top-down way that fails to fit smallholders' real needs. This may have unintended effects on labour, the control of resources and gender relations.

There are also questions concerning the scale of biochar production and application. Debate turns on balance between large, commercial, plantation-based systems as opposed to small-scale, local systems based on the recycling of agricultural wastes.

Transfer of technology or 'indigenous' technology?

Current interest and research on biochar in part lies in the appreciation of Amazonian terra preta: the highly fertile, carbon-enriched 'dark earths' that formed through the settlement and everyday practices of pre-Hispanic populations up to 2000 years ago. Today's Amazonian smallholders value and use terra preta, but the knowledge and practices that created it were seemingly destroyed with European conquest. It is now suggested that the kind of carbon enrichment found in terra preta (and perhaps able to be replicated in part through modern biochar technologies) could be transferred elsewhere – in particular to Africa.

This perspective overlooks the possibility that smallholder farmers in Africa already produce and use biochar and 'dark earths' as part of their existing repertoire of 'indigenous' knowledge and land use. Emerging evidence from West Africa and beyond suggests that this is the case – even though it has, to date, gone unnoticed by soil and agricultural scientists and those researching and developing biochar systems.

Biochar and pathways to sustainability: future challenges

Biochar is no 'magic bullet' for the complex challenges of dealing with climate change and building sustainable agricultures; nor does it offer a panacea for poverty or the problems facing smallholders in resource-poor settings. Nevertheless, beneath the hype and polarised debate, biochar may well offer potential in relatively small scale, locally appropriate systems to link local livelihood needs with contributions to carbon sequestration - as part of diverse technological and land use repertoires.

To realise the promise of biochar:

- existing local knowledge and practices for producing biochar, dark earths and other carbon-enriched soils in smallholder farming systems need to be better recognized: this requires interdisciplinary research and new scientific attention to charcoal in old farming practices;
- pro-poor biochar innovations that suit farmers' perspectives and priorities should build on these local knowledges and practices: this requires a new focus and participatory approaches in biochar projects;
- the diversity of biochar technologies and systems needs to be understood. Different systems will be suitable according to contexts and goals. This will require a more plural and inclusive debate in science and policy;
- the social and institutional (as well as technical and economic) dimensions of biochar technologies and applications need to be addressed. This will require explicit, balanced discussions of governance mechanisms, trade-offs and who will gain or lose.

“Biochar may offer potential in small scale, locally appropriate systems to link local livelihood needs with carbon sequestration”