Forests
Food
Finance

GLF CLIMATE HYBRID CONFERENCE | #GLFClimate

SUSTAINABLE CHARCOAL AND BIOCHAR HELP TO RESTORE FOREST LANDSCAPES

FRONTIERS OF CHANGE

5-7 NOVEMBER 2021

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Federal Ministry for Economic Cooperation and Development

On behalf of:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

of the Federal Republic of Germany

GHANA ROCHA Caring for God's Creation

SLU

CIFOR

Projet co-financé par l'Union européenne

WHITE PAPER

Charcoal as the main driver of forest degradation

Firewood and charcoal provide more than 80% of energy used in sub-Saharan Africa and over 90% of the population in Sub-Saharan Africa (SSA) relies on wood-fuels for cooking and heating (World Agroforestry 2020). Overall, the SSA region produces 65% of the world's charcoal and employs about 40 million people in this sector in the region. The average person in SSA consumes 0.69 cubic meters of charcoal per year. That is 2.5 times more than the amount of wood fuel an average person consumes globally (Mensah 2021).

Charcoal is mainly produced in earthen kilns that are built in the forests or woodlands from where the wood feedstock is chopped and collected (Ndegwa et al. 2020). Due to the low efficiency of 10–15%, the charcoal production and consumption is one main driver of deforestation and degradation, especially in dryland forests across SSA. Farmland expansion is another major driver of forest destruction across SSA. There is general agreement that agriculture in SSA needs to increase its productivity through sustainable intensification (Searchinger et al. 2019; Umweltveränderungen 2020; Otsuka and Fan 2021). Biochar has its role to play in this, because it improves soil properties so that soils can better store plant nutrients and water and deliver them to crops.

Increased yields through biochar

Charcoal and biochar both are the result of biomass that has been charred in the absence of oxygen. In this way, charcoal is produced to be used as an energy source, while biochar is produced to be applied to soils in order to improve soil properties. Multiple meta-studies have shown that yields have increased significantly worldwide after biochar application to soils across a comprehensive range of crops, vegetables, soil types, climates, biochar properties and soil management. The IPCC (2019) estimated an average increase in crop yield of 25% in tropical regions and stated that biochar application improves a number of soil properties and helps to augment crop yields particularly on highly weathered soils.

In Kenya, locally manufactured gasifier stoves that produce biochar were distributed to smallholder farmers. These biochar-producing stoves run on the pyrolysis of wood or other farm residues and use the excess energy from the pyrolysis for cooking purposes in households. These gasifiers produce char during their use for cooking. That char can either serve as another energy source or it can be applied to the farmers' lands to improve soil properties (Njenga et al. 2017, 2021; Gitau et al. 2019; Sundberg et al. 2020b). In comparison with the traditional three-stone open fire, the use of these gasifiers has reduced the demand for wood fuel by 32% when domestically produced char is used as charcoal to provide energy. Thus, the pressure on woodlands and forests has been reduced, given that households can reduce their consumption of wood fuel and commercially produced charcoal. Most households perceived the use of gasifier stoves in a positive way, because they cook faster and cause less indoor air pollution. They also need less fuel, which lightens women's workload substantially.

Woodlots as an option for FLR

Forest landscape restoration (FLR) activities, especially the planting of native tree seedlings is linked with several challenges and risks. A major risk in dryland forest is the regular occurrence of uncontrolled bush-fires during the dry season, as they disturb the natural regeneration, destroy restoration efforts and farmlands, and promote grass growth which leads to an even higher potential for bush-fires. To reduce the risk of bush-fires, green fire belts have been introduced in Ghana around restored areas to serve as both protection against bush-fire and as sustainable woodlots for fuelwood and charcoal.

Green charcoal models

Charcoal production is mainly done in an unregulated and uncontrolled way without any knowledge about the amounts of wood harvested per year and area. Locally developed assurance systems for green charcoal production which include the formation and registration of charcoal producer associations, development of forest management concepts and the implementation of a traceable certification system can support a more controlled and sustainable utilization of natural forests for charcoal production. To be successful, such systems need to be transparent and involve all relevant stakeholders from community to national levels.

Increase efficiency

To create sustainable and controlled wood sources for reducing the pressure on natural forests through charcoal production, energy wood plantations with fast growing tree species in combination with efficient kiln technologies have been introduced in several sub-Saharan countries. Results from the GIZ PAGE2 programme in Madagascar using Green Mad Retort (GMDR) external combustion chamber kilns show that they produce high (34%) and very stable charcoal mass yields, even from wood with a high moisture content – three times more than the yield from traditional kilns. In combination with labelling and the grouped sale of 'green' charcoal in community-run rural centers (CRCs), this can substantially reduce pressure from charcoal production on natural and plantation forests.

For more details visit the following links:

- IKI Website: FLR project in Ghana
- PANORAMA Solutions: FLR Ghana
- Biochar synthesis paper
- GIZ Madagascar Website: PAGE2 Programme
- PANORAMA solutions: Madagascar

References

Gitau JK, Mutune J, Sundberg C, Mendum R, Njenga M. 2019. Factors influencing the adoption of biochar-producing gasifier cookstoves by households in rural Kenya. *Energy for Sustainable Development* 52:63–71.

ICRAF. 2020. Biochar stoves for socio-ecological resilience: Lessons from small-scale farms in rural Kenya. Nairobi, Kenya: ICRAF.

Mensah. 24 February 2021. Why efforts to clean up charcoal production in sub-Saharan Africa aren't working. *The Conversation*. Accessed 22 October 2021. https://theconversation.com/why-efforts-to-clean-up-charcoal-production-in-sub-saharan-africa-arent-working-153462

Ndegwa G, Sola P, Iiyama M, Okeyo I, Njenga M, Siko I, Muriuki J. 2020. Charcoal value chains in Kenya: a 20-year synthesis. Working Paper 37. Nairobi, Kenya: World Agroforestry.

Njenga M, Mahmoud Y, Mendum R, Iiyama M, Jamnadassa R, Roing de Nowina K, Sundberg C. 2017. Quality of charcoal produced using micro gasification and how the new cook stove works in rural Kenya. *Environmental Research Letters* 12:095001.

Njenga M, Sundberg C, Kätterer T, Roobroeck D, Thevs N. 2021. Biochar for climate-change mitigation and restoration of degraded lands. White paper series for the GLF Africa Digital Conference: Restoring Africa's Drylands conference. Global Landscapes Forum (GLF).

Otsuka K, Fan S. 2021. Agricultural development: New perspectives in a changing world. Washington, DC: International Food Policy Research Institute.

Searchinger T, Waite R, Hanson C, Ranganathan J. 2019. Creating a sustainable food future – A menu of solutions to feed nearly 10 billion people by 2050. World Resource Institute.

Sundberg C, Gitau JK, Njenga M. 2020. Biochar production and use provides multiple benefits for smallholder agroecosystems. In FTA 2020 Science Conference – Forests, trees and agroforestry science for transformational change.

Umweltveränderungen WWBdBG. 2020. Landwende im Anthropozän: Von der Konkurrenz zur Integration. Berlin: WBGU.

Programme d'Appui à la Gestion de l'Environnement (PAGE). Vers une modernization de la filière bois-énergie: Série de fiches thématiques sur l'approche et les enseignements de l'experience réalisée.

Forests
Food
Finance

#GLFClimate

GLOBAL LANDSCAPES FORUM

The Global Landscapes Forum (GLF) is the world's largest knowledge-led platform on integrated land use, dedicated to achieving the Sustainable Development Goals and Paris Climate Agreement. The Forum takes a holistic approach to create sustainable landscapes that are productive, prosperous, equitable and resilient and considers five cohesive themes of food and livelihoods, landscape restoration, rights, finance and measuring progress. It is led by the Center for International Forestry Research (CIFOR), in collaboration with its co-founders UNEP and the World Bank and Charter Members.

Charter Members: CIAT, CIFOR, CIRAD, Climate Focus, Conservation International, Crop Trust, Ecoagriculture Partners, The European Forest Institute, Evergreen Agriculture, FSC, GEF, GIZ, ICIMOD, IFOAM - Organics International, The International Livestock Research Institute, INBAR, IPMG, IUFRO, Rainforest Alliance, Rare, Rights and Resources Initiative, SAN, TMG-Think Tank for Sustainability, UNEP, Wageningen Centre for Development Innovation part of Wageningen Research, World Farmer Organization, World Agroforestry, World Bank Group, World Resources Institute, WWF International, Youth in Landscapes Initiative (YIL)

Funding partners

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Federal Ministry for Economic Cooperation and Development

THE GOVERNMENT OF THE GRAND DUCHY OF LUXEMBOURG

FOLUR Food · Land Use · Restoration

gef

@GlobalLF @GlobalLandscapesForum

bit.ly/GLFClimate2021