

Unlocking the Potential of Green Charcoal Innovations to Mitigate Climate Change in Northern Uganda

Lone Dirckinck-Holmfeld**, Collins Okello*, Geoffrey Tabo*, Agatha Alidri*, Arne Remmen**, Quentin Gausset***

*Gulu University, Uganda

**Aalborg University, Denmark

***University of Copenhagen, Denmark

Proposal for a Thematic Session at the 6th AfricaLics Research Conference, Nigeria

Prepared as a case for a thematic session based on the collaborative and multidisciplinary research project with the same name as the panel: Unlocking the Potential of Green Charcoal Innovations to Mitigate Climate Change in Northern Uganda (UPCHAIN), funded by the Danish International Development Agency (DANIDA). The project aims to be an important academic and practical case and will contribute to the following AfricaLics Research Conference themes

- Forging collaborative paths: Public-Private Partnerships for Sustainable Development and Inclusive Growth
- Innovation and sustainable development - the future of formal and informal economies
- Strategies and technologies to improve agriculture Innovation for poverty reduction, resilience to climate change and its impacts
- Innovation for social inclusion and conflict resolution
- Innovation for reducing inequalities in Africa (gender, income, health, human settlements, etc.) and for inclusive, productive and decent work for all.

The panel has been prepared in collaboration between WP & coWP leaders of UPCHAIN.

Background and significance

The energy needs of more than half of Africa's population are currently met by firewood and black charcoal (wood fuel). Its use is inefficient and poses health risks, especially to women and children involved in energy collection and usage (Mainimo et al., 2022; WHO, 2018); Branch & Martiniello (2018). According to Aber (in progress) wood fuel accounts for 90% of energy consumption in Uganda, where it has been a primary energy source for cooking, heating, and electricity generation (Bamwesigye et al., 2020; FAO, 2020; IEA, 2021; UNHS, 2020). The impact of climate change is clear, contributing to the emission of 72.5 million tonnes of Green House Gases (GHG) in 2009 alone from charcoal production in Africa (Bahta, 2020, Aber (in progress)). Northern Uganda is harshly affected with severe environmental degradations (Josephat, 2018). Further, as northern Uganda recovers from more than 20 years of civil unrest and a massive influx of refugees from neighbouring countries, the use of woodfuel and black charcoal for cooking is having serious ecological consequences, potentially leading to conflict with host communities (Branch, 2018).

The use of wood fuel (firewood) most directly affects women and children. Studies from rural areas in Kenya find that they are spending at least one day per week collecting firewood (Nyambane et. al, 2014). In general we know far too little about how household dynamics and gender relations relative to cooking and different types of fuel.

While climate change mitigation often has a more long-term horizon, switching to other energy sources, green charcoal has the potential for an immediate mitigation effect. Green charcoal refers to briquettes made from agricultural residues. However, despite the clear benefits of green charcoal as one of the most promising solutions for sustainable, locally produced, clean and secure energy (BEST, 2013; Mwampamba et. al, 2013; UNDP, Uganda 2014; Global Alliance for Clean Cookstoves, 2015; van Dam, J., 2017) - uptake as a replacement for fuelwood and black charcoal in general remains low (Mwampamba et. al, 2013). However according to medias, in recent years, entrepreneurs, including more women, have begun to venture into the new market of green charcoal entrepreneurship (Olukya, 2021).

This panel on green charcoal innovation presents ongoing research focusing on specific aspects of inclusive green charcoal innovation in Northern Uganda. Overall, we look at the value chain transition: How does local production of quality green charcoal briquettes create value? What new business and technical models can be developed that reflect the needs of different target groups? How does it affect the development of livelihood in the informal and formal sector? and what are the cultural and technical barriers and drivers for the adoption of green charcoal – in households and institutions like schools? And in refugee areas where the stress on natural resources are heavy.

Changing practices and inclusive innovation

The importance of the panel lies in its focus on practice change, alongside the more technical aspects of green charcoal innovation. The innovation of green charcoal is understood as deeply integrated with changes in social, cultural and technical practices. Each practice adds up to a practice architecture in which practices are interconnected and a configuration of each other (Kemmis & Grootenboer, 2008), which means that a single practice (e.g. the use of green charcoal) cannot be transformed without changing the whole practice architecture (semantics, materials, space-time and social aspects) that keep existing practices in place.

Inspired by a concept of inclusive innovation adopted by scholars in South Africa (Kruss, Adeoti, & Nabudere, 2015), we are particularly concerned with exploring innovation in green charcoal practices as a participatory approach, building on localised experiences from households and schools, and from green charcoal producers and facilitators. Inclusive innovation focuses on both the formal and informal economies. In Uganda, according to the World Bank and ILOSTAT, the informal economy accounts for about 72 per cent of enterprises, 78 per cent of the labour force and about 51 per cent of GDP (2022). In order to improve livelihoods and engage all communities in a transformation of fuel use and cooking practices, the research presented here examines innovation in relation to both the informal and formal economies.

To fully understand the complexity of the transformation process as a change in practices, we are further inspired by the concept of 'expansive learning' (Engeström, 2001), which emphasises change as a socio-cultural and socio-technical process, driven by identifying the tensions and contradictions in the activity systems of green charcoal innovations.

The research goes through three phases: (1) Problem identification: questioning, historical and current empirical analysis. (2) Experimenting: modelling, testing and implementing; (3) Learning: reflecting and concluding on the new practices. A change lab (CL), using a mix of participatory data collection techniques, supports the process of expansive learning (Virkkunen, 2013). We are in the second phase of the experimentation phase, in transition to scaling up the design experiments.

Three sites have been selected for the studies and as partners: Gulu town, Pabbo (Amuru district) and Adjumani (Adjumani district) refugee settlements. Principles for site selection include urban, peri-urban and rural lifestyles; types of households; types of producers (smallholder farmers, entrepreneurs, fast-growing agricultural sectors); schools as a nexus for change; and Adjumani District with its particular challenges of extreme depletion of natural resources due to the massive influx of refugees and a welcoming host community.

The novel contribution of this panel is the comprehensive and interdisciplinary research approach that explores the entangled practices of green charcoal, including innovation as a process of change, examining the production side of green charcoal along with the business, social and cultural aspects of adoption and change.

Structure of the session

The session will begin with the chair providing an overview of the UPCHAIN research case, focusing on changing practices, expansive learning, and participatory approaches to inclusive innovation.

In the panel, researchers will present recent research from the UPCHAIN case, which cut across the themes of the AfricaLics Research Conference.

Structure of the session (90 minutes, 10 minutes introduction and background, four presentations of max 15 minutes, and 20 minutes of joint discussion).

Chair: Dr Collins Okello, Dean Faculty of Agriculture, Gulu University & Prof Lone Dirckinck-Holmfeld, Aalborg University

Speakers and presentations:

- Tabo Olok*, Lone Dirckinck-Holmfeld**, Kevin Aber* & Elizabeth Auma Opiyo*. Building a Community of Practice on Green Charcoal Innovation and Adoption - Universities, Communities and Private Partnerships for Sustainable Development and Improved Livelihoods: The role of digital technologies.
- Collins Okello*, Fredrick Amanyire* & Arne Remmen**: Green charcoal – from agriculture residues to resources. Combining technical and social innovations together with local communities.
- Agatha Alidri*, Aloyo Christine*, Hanne O. Mogensen***, Francis Atube* & Charles Okumu*: Household Gender relations in cooking: Green charcoal innovation as an alternative to wood fuel in Northern Uganda
- Judith Awacorach* & Quentin Gausset***: Comparing the livelihood strategies grounded in different green charcoal production models in Uganda
-

*Gulu University, Uganda, **Aalborg University, Denmark, ***University of Copenhagen.

References

- Aber, K. (in progress). Microservice Framework for Research Data Management: A Case of Green Charcoal Innovation. Gulu University
- Bahta, G. A. (2020). *Adoption Determinants of Improved Cook Stove Among Rural Households : The Case of Benishngul Gumuz Reginal State* ,. 10(2), 1–12. <https://doi.org/10.7176/JETP/10-2-01>
- BEST (2013). Biomass Energy Strategy (BEST) Uganda, Ministry of Energy and Mineral Development (MEMD) - GOU, 2013. Accessed: Feb. 22, 2020. [Online]. Available: ile:///Users/lonedirckinck-

holmfeld/Downloads/UNDPUG2014%2520-%2520Biomass%2520BEST%2520Strategy(compressed).pdf

- Branch, A. and Martiniello, G. (2018). Charcoal power: The political violence of non-fossil fuel in Uganda, *Geoforum*, vol. 97, pp. 242–252, doi: 10.1016/j.geoforum.2018.09.012.
- Bamwesigye, D., Kupec, P., Chekuimo, G., Pavlis, J., Asamoah, O., Darkwah, S. A., & Hlaváčková, P. (2020). Charcoal and wood biomass utilization in Uganda: The socioeconomic and environmental dynamics and implications. *Sustainability (Switzerland)*, 12(20), 1–18. <https://doi.org/10.3390/su12208337>
- Branch, A. (2018). From disaster to devastation: drought as war in northern Uganda', *Disasters*, vol. 42, pp. S306–S327, doi: 10.1111/disa.12303.
- Engeström, Y. (2001). Expansive Learning at Work: Toward an activity theoretical reconceptualization, *J. Educ. Work*, vol. 14, no. 1, pp. 133–156, doi: 10.1080/13639080020028747.
- FAO. (2020). The State of the World's Forests. In *Geographical Review* (Vol. 14, Issue 1). <https://doi.org/10.2307/208372>
- Global Alliance for Clean Cookstoves (2015). Market Research in the Clean Cooking Sector: Tools and Tips', *Clean Cooking Alliance*.
- IEA. (2021). Renewables 2021. *International Energy Agency (IEA) Publications International.*, 167. www.iea.org/t&c/%0Ahttps://webstore.iea.org/download/direct/4329
- Josephat, M. (2018). Deforestation In Uganda: Population Increase, Forests Loss And Climate Change.', *Environ. Risk Assess. Remediat.*, vol. 2, no. 2, pp. 46–50, doi: 10.4066/2529-8046.100040.
- Kemmis, S. and Grootenboer, P. (2008). *Situating praxis in practice: Practice architectures and the cultural, social and material conditions for practice*. Brill, doi: 10.1163/9789087903275_004.
- Kruss, G., Adeoti, J. O., and Nabudere, D. (2015). Bracing for change: making universities and firms partners for innovation in sub-Saharan Africa' in *Developing National Systems of Innovation*, Northampton, MA: Edward Elgar Publishing, Available: <http://www.elgaronline.com/view/9781784711092.xml>
- Mainimo, E. N., Okello, D. M., Mambo, W., & Mugonola, B. (2022). Drivers of household demand for cooking energy: A case of Central Uganda. *Heliyon*, 8(3), e09118. <https://doi.org/10.1016/j.heliyon.2022.e09118>
- Mwampamba, T. H., Owen, M., and Pigaht, M. (2013). Opportunities, challenges and way forward for the charcoal briquette industry in Sub-Saharan Africa, *Energy Sustain. Dev.*, vol. 17, no. 2, pp. 158–170, doi: 10.1016/j.esd.2012.10.006.
- Nyambane, A., Njenga, M., Oballa, P., Mugo, P., Ochieng, C., Johnson, O. and Iiyama, M. (2014). Sustainable firewood access and utilization: Achieving cross-sectoral integration in Kenya. World Agroforestry Centre (ICRAF) and SEI brief.
- Olukya, G. (2021). Environmentally friendly green charcoal could save Uganda's forests'. <https://www.aa.com.tr/en/africa/environmentally-friendly-green-charcoal-could-save-ugandas-forests/2334633>.
- UNDP, Uganda (2014). The Green Charcoal Project - Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach. Available: <https://info.undp.org/docs/pdc/Documents/UGA/Charcoal%20project.pdf>
- UNHS. (2020). Uganda National Survey Report 2019/2020. *Uganda Bureau of Statistics*, 1–76.
- van Dam, J. (Lead consultant) (2017). *The charcoal transition*. Rome, Italy: FAO, 2017. <http://www.fao.org/documents/card/en/c/a19084da-53ca-4ec8-a0dc-0200d8390d65/>
- Virkkunen, J. (2013). *The Change Laboratory: A Tool for Collaborative Development of Work and Education*. Sense Publishers, 2013. doi: 10.1007/978-94-6209-326-3.
- WHO. (2018). Household Air Pollution and Health. *Who*, 1–9.