

# Adoption of Agricultural Waste Charcoal Briquettes in Uganda: User Evaluation



D-BRIEF from MIT D-Lab Scale-Ups – Winter 2014

## RESEARCH OBJECTIVES

**Identify the changes** experienced by users cooking with agricultural waste briquettes as compared to wood charcoal.

**Collect feedback** on the agricultural waste briquettes and assess how they compare to wood charcoal.

**Assess the potential market** for charcoal made from agricultural waste in Soroti and Bugiri, Uganda.



Kilns and bagged agricultural waste charcoal at Teso Women Development Initiatives, Soroti, Uganda.

## Households & institutions prefer agricultural waste briquettes over wood charcoal.

In summer of 2013, a D-Lab Scale-Ups team conducted an initial evaluation of user experience with agricultural waste briquettes produced and sold in Uganda by two enterprises, Teso Women Development Initiatives (TEWDI) in Soroti and Nakabale Integrated Development Group (NIDG) in Bugiri.

The team documented fuel uses and preferences, familiarity with the product and producers, and benefits experienced by the users of the briquettes made and sold by TEWDI and NIDG. Although the composition of the briquettes and production process are similar for both enterprises, but not exact, many of the results and feedback are similar. As a result, this brief aggregates the findings.

Both TEWDI and NIDG are enterprise partners in the Harvest Fuel Initiative (HFI), a collaboration between MIT's D-Lab and The Charcoal Project. HFI provides technical, business, and marketing assistance to enterprises that make charcoal briquettes from agricultural waste.

## Key findings and recommendations

In general, TEWDI's and NIDG's customers were satisfied with the agricultural waste briquettes.

Reported benefits of cooking with the briquettes:

- Less smoke, longer lasting fuel, cleaner kitchens, reduction in fuel use, savings on fuel expenditures, and health benefits.

Recommended changes to the briquettes:

- Make the briquettes easier to light, include a description of how they are made, make the sizes of the briquettes more standard, and reduce or reuse the ash produced.

Recommended changes in production, sales, and marketing:

- Increase supply and accessibility, provide training on briquette production, increase marketing efforts in response to strong demand.

### Study methodology

The team collected data through individual interviews. One-hundred twenty-four individuals participated in the interviews, which included members of households as well as institutions, such as schools, restaurants and an orphanage. Charcoal vendors were also interviewed. (This D-Brief focuses on findings for the household and institutional users. For findings on the experience of charcoal vendors, please see the full report.)

The team conducted semi-structured interviews. The household and institutional interviews included questions on fuel use and preferences, fuel expenditures, and familiarity with product and producers.

HFI coordinated with TEWDI and NIDG to recruit the household and institutional customers for the study. The enterprises mapped out the household customers and identified a sample of households in each cluster of customers. The team then matched users with non-users as best they could, based on size of household and standard of living. The institutional clients and non-clients were selected by the enterprises.

It is important to note that the number of institutional clients was somewhat limited at the time of the study, as both enterprises had just started providing products to these client segments.



Robert Ekiring (right) and Mpago Ali Wedulo (left) of Nakabale Integrated Development Group with agricultural-waste charcoal briquettes.

### Cooking in developing countries

It is estimated that over 2.5 billion people in developing countries rely on biomass such as firewood, charcoal, agricultural waste, and animal dung to meet their energy needs for cooking (OECD, 2006). In Sub-Saharan Africa, it is estimated that 81 percent of the population uses biomass fuels for cooking (GACC, 2014). The number of households in Sub-Saharan Africa using solid fuels has doubled over the past 30 years, reaching 730 million (IEA, 2010).

Among biomass fuels, wood charcoal is one of the most widely used resources across the developing world (Kammen & Lew, 2005). Due to the growing population and increasing energy needs, the demand for charcoal is only expected to increase in the coming years.

### The need for agricultural-waste briquettes

The impact of using wood charcoal can be significant and detrimental to health, the environment and the economy. About 1.3 million people, mostly women and children, die prematurely every year because of exposure to indoor air pollution from biomass (OECD, 2006). Environmental damage can also result in land degradation and regional air pollution. Harvesting wood to produce charcoal is common and poorly regulated. Given the massive demand for charcoal in Africa, pressure on natural woodlands and forests is high, and rates of deforestation and degradation are increasing (World Bank, 2009). Additionally, the increase in demand for wood charcoal and the declining supply of wood is driving up prices. Finally, valuable time and effort is devoted to fuel collection instead of education or income generation (World Bank, 2009). Thus, biomass, including wood charcoal, can have significant detrimental effects on the livelihoods of the users.

The preceding scenario demonstrates that there is a need to introduce and promote alternative fuels. Charcoal briquettes produced from agricultural waste offer a sustainable solution to the problem. Briquettes made from agricultural residues offset the wood harvesting thereby preventing deforestation. In addition, the briquettes are 20 to 30 percent cheaper than the regular charcoal in Uganda. They can be produced locally and they generate less smoke than wood charcoal. Thus, briquettes are good alternatives to wood charcoal. When briquettes are coupled with a better cookstove, there is further potential to have greater impact on reducing fuel use and increasing savings, improving health outcomes, and reducing degradation of the environment.

## Detailed findings

The D-Lab team documented fuel uses and preferences, familiarity with product and organizations, and benefits experienced by the users (households and institutions) of the briquettes made and sold by TEWDI and NIDG. There were some interesting trends in fuel use and preferences across the groups in Soroti and Bugiri.

### Fuel sources

Most of the groups use wood for heavy and light cooking, wood charcoal for heavy and light cooking and ironing, and kerosene for lighting. Many of the users reported using less wood charcoal and some reported using less wood after starting to use briquettes.

### Changes in fuel costs during the year

Fuels costs varied depending on the fuel and in some instances, the season. Costs for wood charcoal tended to increase in the rainy season. Kerosene stayed consistent during the year.

### Benefits of the briquettes

In general, the customers were satisfied with the briquettes and reported many things that they like about the briquettes. All of the segments of users (households and institutions in Bugiri and Soroti) reported that they like that the briquettes produce less smoke, last longer, and burn more cleanly. Some users reported that they are using less charcoal and experiencing health benefits such as less coughing since they started using the briquettes. In Bugiri, users also liked that the briquettes produce less ash and they light well. In Soroti, users liked that the product keeps the heat longer, they cook faster and the users do not have to add more charcoal. Users in Soroti also reported spending less money on fuel, using less wood, faster cooking, stronger heat, and less tending to the fire as a result of using the briquettes.

### Recommended changes to the briquettes

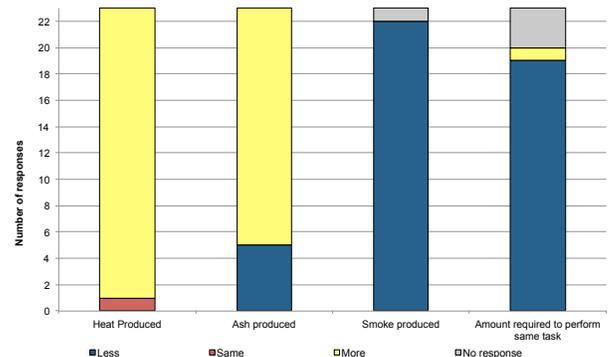
Users in three segments also had some recommended changes to the briquettes. The number one issue is increasing supply. In Bugiri, users also recommended increasing accessibility and selling points, providing training on how to make the briquettes and reducing the price of the briquettes. Users in Soroti also indicated that they would prefer if the briquettes were easier to light, the bags of briquettes include a description of how they were made, the sizes of the briquettes were more standard, the ash was reduced or reused, the briquettes were more compact and stronger, it was easier to add more briquettes, and smaller packets of briquettes were available for sale.

The producers of the briquettes are currently working with HFI to make some of these changes and improve the products. However, in general, the products were well received by the users.

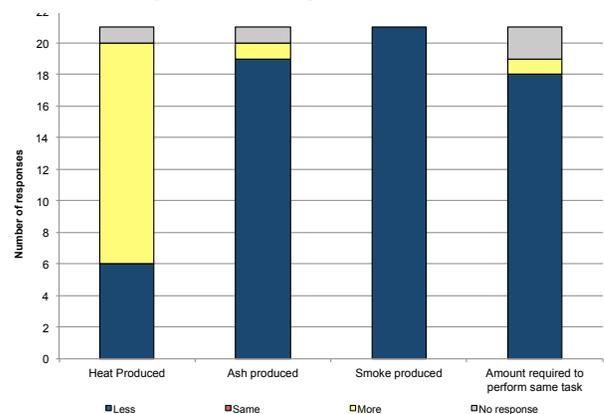
### Comparison to wood charcoal

One customer reported that the briquettes are comparable to wood charcoal, while the rest of the participants indicated that the briquettes are better than wood charcoal. Across all segments, customers generally agreed that the briquettes produce less smoke than wood charcoal and require less fuel for cooking—a confirmed through preliminary lab or field testing. The amount of heat produced by the briquettes was somewhat mixed. Most of the users in Bugiri reported less ash than wood charcoal, while one reported more. Users in Soroti indicated that the briquettes produce more ash than wood charcoal in general. Overall, the briquettes repeatedly performed better than wood charcoal.

*TEWDI Briquettes in Comparison to Wood Charcoal*



*NIDG Briquettes in Comparison to Wood Charcoal*



### Market demand for briquettes

It is apparent that there is demand for the briquettes, as people are purchasing briquettes, the number one recommendation from users is to increase supply, and some of the non-user households and institutions are willing to try out the briquettes. Since the evaluation, non-users have communicated to the producers that they are interested in purchasing the product. There is a need to share more information through channels such as word of mouth and radio. The marketing of the briquettes is critical and could have a significant impact on the enterprises.

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## COOKSTOVES

Sixteen study participants, ten individuals and six institutions also reported on the use of cookstoves produced and sold by TEWDI.

In general, customers were satisfied with the product and would recommend them to others. Interviewees reported that the stoves are more efficient and cleaner burning, have good airflow and retain heat well, are more convenient to use and cook faster, are better insulated and produce the same or less smoke.

## Next steps

The agricultural waste charcoal enterprises have received the user feedback and many of the recommended changes have been implemented. Given the demand for the products, the enterprises have been developing marketing strategies that highlight these findings and establishing more sales locations.

Research on the impacts of briquettes made from agricultural waste has been fairly limited so far. This initial study provides good, largely qualitative self-reported information. To confirm these findings and test some of the hypotheses, the team hopes to conduct a larger-scale impact evaluation in Uganda in the future. The team is in the process of applying for funding to conduct this study in collaboration with an outside, independent research organization.

## Future impact

Although the results from this study are specific to the context and market in Uganda, many of the findings, insights and hypotheses about briquettes made from agricultural waste can be tested in other locations in East Africa and beyond.

## Acknowledgments

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## Further information & full report

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*Launched in 2011 by D-Lab, the Scale-Ups program assists social entrepreneurs from MIT and the developing world, as well as NGOs and corporations, to bring poverty alleviating technologies to market at scale.*

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