



How Research Drives Stove Adoption in Sierra Leone

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Burn Design Lab

Summer 2025 Newsletter

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Earlier this summer, Burn Design Lab traveled to Sierra Leone to advance our household stove project, a key initiative aimed at reducing fuel costs, improving cooking efficiency, and creating healthier kitchens. The trip was divided into two main phases: design for manufacturing refinement and user research.

In the first phase, our team worked closely with local partners Westwind Energy to improve their design for manufacturing and manufacturing process improvements. Using their existing stove design as a baseline, BDL engineering team collaborated with the WWE team to speed up production, reduce bottle necks, and prototype initial stove designs for use in our User Research study. Further manufacturing process improvement work will continue following the study and subsequent design changes.



Once we had finalized prototype models for both wood and charcoal use, we moved into the second phase: understanding what users want most in a stove and how the designs measure up. The goal wasn't just to test performance, but to learn directly from the people who would be cooking with these stoves day in and day out.

Our team surveyed households, conducted interviews, and observed cooking sessions to capture both qualitative impressions and technical data. This on-the-ground research provided an invaluable perspective ensuring our designs aren't just efficient in the lab, but loved in the kitchen.

Our team surveyed users both before and after they tried our household stove prototypes, gathering valuable feedback on design, performance, and usability. Participants shared what they liked and disliked, their willingness to pay, and how likely they would be to adopt the stove long-term. This feedback was paired with technical data from Controlled Cooking Tests (CCTs), where each stove was used to prepare the same local meal – lafidi, a combination of rice, stewed vegetables, and pepper sauce. We carefully measured fuel use, ingredient and water mass, time to light, time to boil, and total cook time.

Top: Patrick and a Research Assistant recording timestamps of when a stove boils during user research sessions in Sierra Leone. Left, Top: Research participants in Sierra Leone actively comparing six different charcoal stove models to find their favorite features. Left, Bottom: Research participants cooking Lafidi, a dish made from a combination of rice, stewed vegetables, and pepper sauce, on the BDL's HP3C charcoal stove.





The findings confirmed that local cooking habits and fuel economics play a significant role in adoption. In Kambia, a more rural district, wood fuel use was more common, while most households in Freetown, the major city in Sierra Leone, used charcoal. Almost all participants purchased their fuel from the market, with an average monthly costs of approximately SLE 210, or 20% of some individuals average monthly income, making fuel savings an important selling point.

When asked what they value most in a stove, users consistently named three priorities: strength (durability and stability), fast cooking, and cost savings. WVE's baseline wood stove received high marks for cooking speed, efficient airflow, and its ability to hold large pots. Many also appreciated its sturdy build, attractive design, and resistance to rust. Features like the ash tray for easy cleaning, an optimal cooking height, and a deep fuel chamber added to its appeal.

To extend our research further, 20 stoves were distributed for home placements, 10 wood-burning models in Kambia and 10 charcoal stoves in Freetown. This real-world testing will give us more insight into performance, durability, and day-to-day user satisfaction. By listening to users and combining their feedback with precise performance testing, we're ensuring that our stoves meet the real-world needs of Sierra Leonean households. The result will be more than just an efficient product, it will be a stove people are eager to use and keep using. This approach is central to BDL's mission: creating designs that people adopt, because they are built for their lives.

Top, Left: Country Director Aaron Nyarkotey and a Research Assistant asking questions to research participants. Top, Middle: A curious child investigating a stove emissions monitor as a wood stove cooks lafidi. Many data points are recorded during field and user research testing to inform us of a stove's performance. Top, Right: An HP3W in operation by research participants. Bottom: Researchers show participants in Sierra Leone the features of six charcoal stoves.



From the Board: Ricardo Sitchin

BDL's mission resonates with me, personally. 40 years ago I was a Peace Corps volunteer in Kenya. I worked mostly with women's groups, and got to see firsthand just exactly what it means to cook over an open fire, as hundreds of millions of people do. Think campfire, wood in a little pit, just like what many of us enjoy - but with 2 differences. Instead of buying firewood at Safeway, the women - or their daughters, who really should be in school - spend hours a day gathering wood from the same forests they have been picking over their whole lives. And the campfires are indoors. I'd go into their tiny kitchens and leave a minute later with eyes and lungs burning.



"The women would laugh at me, and tell me that you get used to the smoke. And yet millions die prematurely each year as a result."

So when I first heard that BDL designs stoves that take far less wood, and produce almost no smoke, they had my attention. And when I learned that their first client had a factory in Nairobi, employing local workers to produce 10K stoves per month, I was hooked.

That was 9 years ago, and I joined BDL as a volunteer. I'm on their leadership team, board of directors, and do their recruiting. I'm so impressed by the big results this little non-profit delivers.

Ricardo Sitchin serves on BDL's Board of Directors, with a career background in a number of diverse industries and both a M.S. in Chemical Engineering and an MBA. If you are interested in joining our Board of Directors, please reach out to info@burndesignlab.org.

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