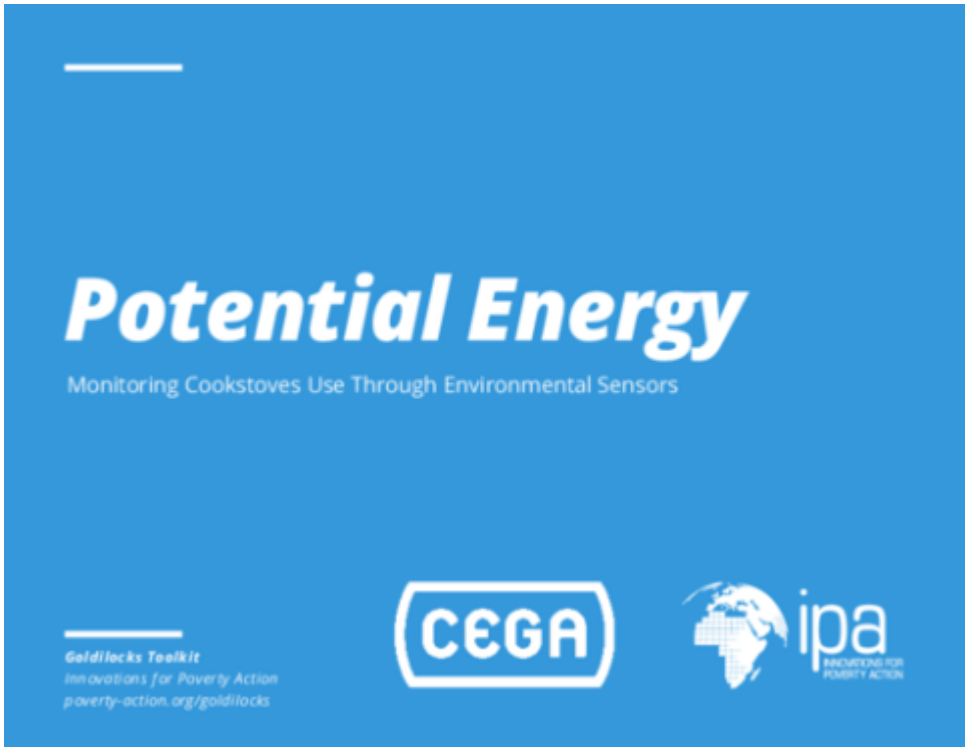

Goldilocks Case Study: Potential Energy

Potential Energy: Monitoring Cookstoves Use Through Environmental Sensors

Around the world, 3 billion people cook with biomass, causing over four million annual premature deaths, and generating 30% of global black carbon emissions. In addition to the acute health and environmental effects of biomass cooking, there are economic effects, as women across the developing world spend considerable time and money acquiring fuel. For a family in Sub-Saharan Africa, it can cost between 10-30% of total household income to purchase fuel for cooking fires.

Potential Energy (PE) is a not-for-profit organization with a mission of making cooking safe, and affordable, for women and their families. PE's core product is the Berkeley-Darfur Stove (BDS), a high-efficiency wood-burning cookstove. As compared to preparing meals over an open fire, the BDS was designed to save users 50% on fuel while reducing cooking time and exposure to smoke. To date, PE's primary focus has been the distribution of the BDS in Darfur, Sudan, where over 44,000 stoves have been distributed through humanitarian and non-humanitarian channels.

While PE's work is grounded in the belief that cookstoves can minimize environmental, health, and economic costs, the technology can only achieve impact if used consistently by cookstove owners. As part of its M&E strategy, PE wanted to understand how well (or poorly) they were achieving adoption and regular use of their improved cookstoves.

PE worked with researchers at CEGA to deploy temperature sensors, called “Stove Use Monitors,” attached to stoves distributed in Sudan. The sensor data, alongside personal interview surveys recorded both by hand, and also via a smartphone software App, were then analyzed to understand stove usage, and identify interventions or “nudges” that might improve regular use. The aim was to go beyond self-reported use through surveys, which can suffer from recall errors, courtesy bias and other forms of errors or over-reporting.

Technology Solution and Application

The ability to monitor cookstove use with objective and unobtrusive means is critical for improving the product and its delivery, and for measuring impact on households. Some studies have already implemented time-and-temperature logging Stove Use Monitors (SUMs), which can independently measure cooking events. Here, CEGA researchers sought to improve upon previous work by measuring (1) adoption of cookstoves in the context of camps for internally displaced persons (IDPs), and (2) the correlation between user-reported and sensor-measured cookstove adoption both in terms of number of cooking events and hours spent cooking per day.

The Berkeley Darfur Stove (BDS) is the subject of this study. The BDS was developed by scientists and students at the University of California, Berkeley and Lawrence Berkeley National Laboratory. PE managed the technology’s implementation in Darfur, Sudan. Between 2009 and 2015, more than 44,000 BDSs were distributed in North Darfur to rural, peri-urban and internally displaced households. About 85% of these cookstoves, including those employed in this study, were disseminated free of charge in the IDP camps.

The Darfur SUMs experiment involved 180 women within the Al-Salam IDP camp just outside of Al-Fashir, North Darfur. The Omda (leader) of each of five administrative units was asked to select 36 women to participate in the study and be available for surveys. A baseline survey was performed to determine household demographics and cooking practices at the time of BDS dissemination. Subsequently, each administrative unit was followed up with every two weeks. Baseline and follow up surveys were administered by teams of two enumerators who recorded responses on paper and on a cell phone platform running Open Data Kit (ODK). An ODK Aggregate instance was deployed at Berkeley to communicate and collect data from our devices in the field.

November 28, 2016