

A Mission to Darfur

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Civil war in the Sudan has made Darfur one of the largest refugee zones in the world. Aid organizations estimate that two million people are in refugee camps in this area of western Sudan; since 2003 somewhere between 200,000 and 300,000 people have been killed.

A critical problem for refugees is the lack of fuel for cooking, which drives women to leave the safety of the camps and walk hours to find firewood, subjecting themselves to attacks and rape by raiders roaming the countryside.



A long walk for firewood

Ashok Gadgil and Christina Galitsky are members of a team from Berkeley Lab's Environmental Energy Technologies Division (EETD) who recently went to Darfur to test simple cookstoves designed to use less wood or alternative fuels like animal dung. Efficient stoves could help reduce the vulnerability of women in Darfur's camps, and in the long run, by reducing pressure on the surrounding environment, could help the landscape recover.

"There were two big uncertainties before we left," says Gadgil. "First, we needed to know what kind of wood the refugees use for fuel; what are the common shapes and sizes of the pots they use; what foods they eat; and what their cooking method is. All this affects the stove performance."

Second "was the security situation.... We monitored the situation as closely as we could on a daily basis. We were not going there to prove our bravery."

Cooking over a three-stone fire

Refugees typically cook over a fire surrounded by three stones; the stones support the pot. The main part of the meal involves boiling a thin mixture of water and flour made of sorghum, millet, wheat, and corn flour supplied by the UN's World Food Program. Flour is gradually added until the boiling mixture forms a thick dough called *assida*. The pot has to be supported firmly enough to stand up to continuous vigorous stirring of the very viscous dough. The meal is served with a hot sauce of fried vegetables and meat or yogurt.



Ashok gets a cooking lesson. A traditional three-stone fire is visible at right rear.

Gadgil and Galitsky took with them three models of energy-efficient cookstoves, all available off the shelf from commercial sources or easily manufactured in a light industrial setting. One of the designs was rejected early because it couldn't stand up to the vigorous stirring. To prove that the stoves could cook a meal using much less fuel than a three-stone fire, they arranged demonstrations with the help of aid workers and camp leaders.

“We laid out an equal number of same-weight bundles of wood in front of each stove,” Gadgil explains. As they cooked, the audiences could see how much faster the wood in front of the three-stone fire disappeared. “It was a dramatic way for them to understand they could achieve 50-percent savings—there was tremendous excitement during these demonstrations.”

One demonstration was attended by 250 women and 100 sheikhs. The leader of the entire camp made an appearance, underscoring what high importance the refugees and their leaders attach to reducing the burden of fuel wood collection for the women.

In some parts of Darfur, “over half the women have stopped collecting fuel wood and are buying it now,” says Galitsky. “Many families sell a fraction of their food ration to buy wood, but this food ration is already inadequate.”

Next steps—development and roll-out

“We think that the sheet-metal stoves can be manufactured locally fairly easily at a cost of about 10 dollars,” Galitsky says. “We estimate the stoves can save the equivalent of \$150 in fuel wood per year for an average household of seven people.”

Aid agencies will either have to help build workshops in the camps or have stoves built in nearby towns with shops capable of working sheet metal; iron-casting facilities are nonexistent. Sheetworking in the camps would help grow a local economy and provide employment.

“A staged roll-out with built-in feedback for corrections is an important feature of the program,” Gadgil says. “We don’t want to make the same mistake 300,000 times.” The Berkeley Lab team and its supporters



Christina tests one of the stoves she took to Darfur as part of the EETD team.

recommend a roll-out of 50 stoves, so the team can determine what works technically and what doesn’t.



Ashok Gadgil and Christina Galitsky

The follow-up phase planned by aid agencies will be a “social roll-out,” selling up to 500 stoves to families in the camps and establishing metal workshops. Gadgil agrees that the stoves should not be given away for free, less they be undervalued and sold for scrap. A revolving loan fund within the community could finance stove purchases and stimulate entrepreneurship.

Galitsky emphasizes the importance of educating people to use the stoves properly. “An overstuffed wood stove will still consume all of the overstuffed wood.”

She offers high praise to the participants in the effort, with financial support came from several sources including the U.S. Agency for International Development’s Office of Foreign Disaster Assistance, via CHF International. “CHF International’s headquarters and local staff were very generous and helpful ... the locals in the camps were supportive as well.”

Gadgil says, “This is a Band-Aid, not a fundamental solution to the problem, but this is what we can do. We are trying to tap into the existing knowledge.... We have now shown that we can make a difference.”

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