How to Save a Life

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The conflict in Darfur, an arid place the size of Texas, has left rural villages burned to the ground, families torn apart, and the landscape devastated. As many as 400,000 people have died there due to violence, disease, and starvation over the past five years. Some 2.5 million now struggle to survive in the Internally Displaced Persons (IDP) camps in Darfur and neighboring Chad, where women must trek several miles to search for firewood. These journeys take nearly seven hours roundtrip and often expose them to the brutality of the Janjaweed, roving militias that prey upon refugees.

In 2004, the United States Agency for International Development contacted Ashok Gadgil, of the Lawrence Berkeley National Laboratory, for help. Gadgil's idea: design a fuel-efficient, portable stove for Darfur. To do so, he enlisted Christina Galitsky and a team of graduate students, who were eager to join the project. "Anything we can do to minimize the time they spend foraging for firewood increases the chance the women will return safely," says Galitsky.

In November 2005, the researchers traveled to Darfur and brought along a cylindrical stove made of sheet metal, two feet high and 14 inches in diameter. At one of the camps they visited, in Kalma, they found over 90,000 men, women, and children living in mud huts. "The conditions were appalling," recalls Galitsky. "You could see the desperation everywhere, the terror in their eyes and voices."

There, Galitsky rolled up her sleeves, lit the stove, and cooked a potful of assida, a sticky dough made of flour, oil, and water that the Sudanese top with fried onions, tomatoes, meat or yogurt, okra, and spices — their daily staple. As the women watched her cook using only half as much wood as in traditional three-stone fires, word spread quickly. At an encore demonstration, over 250 women, 100 sheikhs, and others of high rank came to witness this feat. Even the camp leader, running a high fever, left his sickbed to attend.

The trip to Darfur was high risk since aid workers had been targeted in Sudan, prompting the United Nations to pull its workers out of West Darfur the week prior. The Berkeley team "monitored the situation as closely as we could on a daily basis," says Gadgil, and only traveled by air since overland passage was dangerous. "We were not going there to prove our bravery!"

Photo courtesy of LBNL

Making assida: Galitsky shows the women of Darfur how to use the cookstove.

Back safely in their lab high above the campus, they have further refined the stove, making it strong enough for vigorous stirring and able to withstand the wind. The Berkeley-Darfur stove is now four times more fuel-efficient and requires 75 percent less wood. Not only that, it can be assembled easily from flat kits and without access to electricity. In other words, they will soon be able to turn over production to the people of Darfur, bringing them jobs and income. The first 50 stoves produced were snapped up quickly. Plans are in motion to begin mass-producing the stoves, as at least 300,000 are needed. The researchers are working with two nonprofits, Engineers without Borders and CHF International, to establish workshops in Sudan.

Photo courtesy of LBNL

Lab partners: Ashok Gadgil, senior staff scientist, and Christina Galitsky, principal research associate, work together in the Environmental Energy Technologies Division at Lawrence Berkeley National Laboratory.

Gadgil, who is originally from Mumbai and came to Berkeley as an international graduate student to study physics, is drawn to projects that will improve life in developing countries. In the early 1990s, he designed a device that uses ultraviolet light to quickly, safely, and cheaply disinfect water of the viruses and bacteria that cause cholera, typhoid, dysentery and other deadly diseases. Now patented, and manufactured by Water Health International, the simple machine (called UV Waterworks) is used in Mexico, the Philippines, India, and Ghana.

More recently, he and Galitsky have been exploring ways to remove arsenic from well water in Bangladesh, using ash. "Christie is not only an outstanding thinker who applies her mind to solving real-world problems," says Gadgil, "she's a risk taker in the best sense of the word."

Galitsky clearly enjoys challenges and says her graduate training in chemical engineering gave her the skills for problem-solving. "I wanted to work on problems that had a direct, profound impact on people's lives," she says, "things like clean water or clean air, things we need just to live."

— *Lisa Harrington*