CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

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Project Number
S1608

Project Title
Maximizing Thermal Efficiency: Darfur Stoves

Abstract

Objectives/Goals
The focus of this project is the wood fuel needs of refugee camps in the Darfur region of Sudan. We added insulation to a basic chimney style metal cooking stove to create an original design that could be assembled using recycled materials. We hypothesized that we could design a cooking system significantly more efficient than traditional methods that would reduce the wood fuel demands of the refugee camps. Reducing wood consumption in the camps would reduce the time women spend looking for wood outside of established security zones.

Methods/Materials
We constructed two metal stoves and tested their thermal efficiency against the traditional three stone fire used in refugee camps in Darfur and around the world. The metal stove design was patterned loosely from a stove developed at the University of California Berkeley for use in Darfur. We surrounded one of the stoves with a two-inch layer of wood ash insulation. The two metal stoves were made out of completely recycled metal. We also evaluated the use of insulation systems to cook with retained heat.

Results
Our insulated stove had an average thermal efficiency of 32.4%, more than quadruple the 7.9% average efficiency of the three stone fire. The non-insulated metal stove had an average efficiency of 28.1%. The metal stoves also reduced the time necessary to reach boiling point. Cooking with retained heat further decreased the wood needed to satisfy cooking demands.

Conclusions/Discussion
We successfully demonstrated an improved cooking stove design that is significantly more efficient than the current cooking methods used in the Darfur refugee camps. The stove can be assembled in the camps from low-cost materials available to refugees. The use of these stoves on a wide-spread basis would decrease fuel wood consumption and the associated hazards women face when gathering wood away from the refugee camps.

Summary Statement
We designed and tested metal cook stoves with fuel-efficient properties that could potentially benefit refugees in the Darfur region of Sudan.

Help Received
Received advice and equipment from Mr. Earl Peters. Father helped with stove construction.