Extinguishing the Three-Stone Fire

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Motivations for this Talk

- **“If a brother or sister is ill-clad and in lack of daily food, and one of you says to them, ‘Go in peace, be warmed and filled,’, without giving them the things needed for the body, what does it profit?” -- James 2:16** RSV

- **“Having gifts that differ according to the grace given to us, let us use them” -- Romans 12:6** RSV

The Poor Woman's Burden

- The vast majority of cooks in the world are women
- Married to the hearth
- The hearth is often a pot set over three stones
- Cooking takes up much of the time every day

Chantal in Obire, Burkina Faso – photo by S. Showalter

The Cooking Fire: Root Cause of Perpetual Poverty

- Living in smoke since birth
- Condemned to hard labor
- No days off for study or employment

Deforestation

Libro Cocina Report

Forests turned into Charcoal for Cooking

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Respiratory Diseases

http://www.itdg.org/?id=smoke_index

Refugee Camps

Three Billion …

- **People dependent on open fire cooking**
- **3.8 million / year premature deaths from respiratory diseases** (WHO, Feb. 2016)
- **Hazardous labor**
- **Fuel cost**
- **Lost opportunities for school & work**
- **Deforestation – e.g. 98% in Haiti**
  - **Soil erosion follows**
  - **Habitat loss follows**

What is Being Done in Cookstove Research?

- Darfur stove project at LBL
- Cookstove testing centers (EPA & DOE, Aprovecho)
- Global Alliance for Clean Cookstoves launched, 2010
- Cookstove program of EPA, $8.5 M, concluded in 2016.

- In short, NOT MUCH!

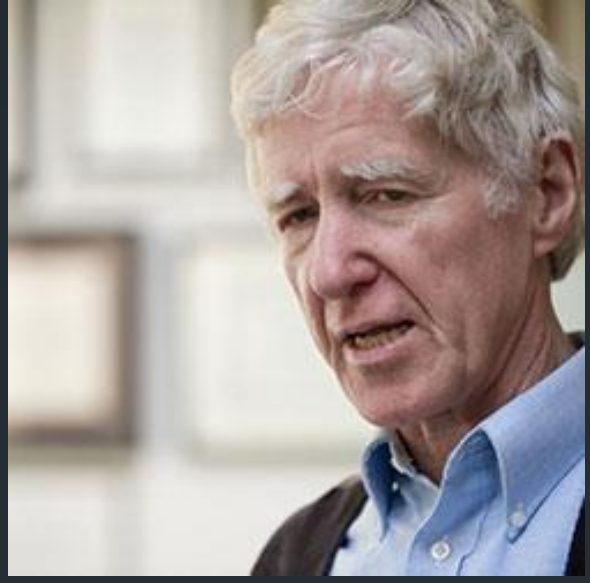
US EPA

Global Alliance for Clean Cookstoves

ISO Standard Development for "Clean Cookstoves and Clean Cooking Solutions", ISO-19867

Global Alliance for Clean Cookstoves

Lester Brown, 1976:



"We need a basic overhaul, restructuring, and reorientation of the research establishment. We need to look around, establish what the pressing needs are - solar technology is one, the development of a solar cooking device to offset the world firewood crisis…. We can't divorce anything from the needs of the rest of the world."

***Science*, v. 193, 6 Aug. 1976**

What is a Solar Cooker?

Panel type Solar Cookers (“CooKit”)

Box Cooker

Parabolic Solar Cooker

Source: Solar Cookers International

Solar Household Energy, Inc.

- Nonprofit organization based in Washington, DC
- Mission: ***"To unleash the potential of solar cooking to improve living and environmental conditions in sun-rich areas around the world."***

- ***Research***
- ***Education***
- ***Field projects***

Research Strategy

- **To build a community of collaborating scientists and engineers engaged in solar cooker research**
  - **Recruit a diverse range of advisors in many specialties**
  - **Collaborate with other organizations worldwide**
  - **Expand access to grant funding**

- **To "raise the bar" on quality of design, testing and reporting of solar cooker performance**
  - **Measure and report power data according to ISO standard protocol**
  - **Publish designs and results in respected peer-reviewed journals**

The CooKit: Low cost, not durable

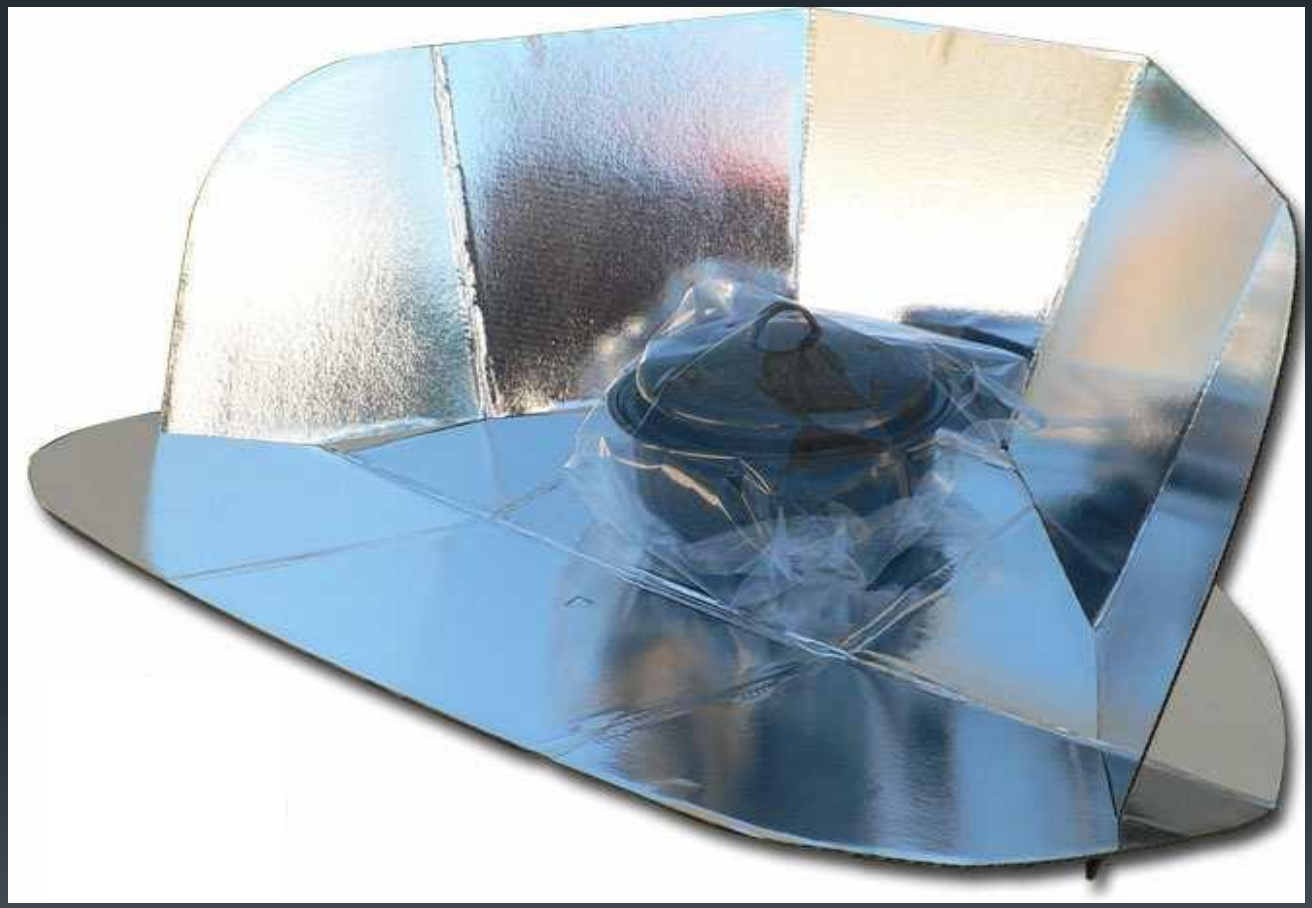


Photo: Solar Cookers International

$39 US retail

The HotPot: a Panel Solar Cooker – Durable (glass, steel, aluminum)

$185 retail

Solar Cooker Distribution in Chad, 2011

Photo: Patrick Fourrier

Solar Cooker Distribution in Haiti, 2016

SolSource Parabolic cookers ($439 US retail) in Tilory, Haiti

photo: Solar Household Energy, Inc.

Project 1: Reduce the Cost of a Solar Cooker

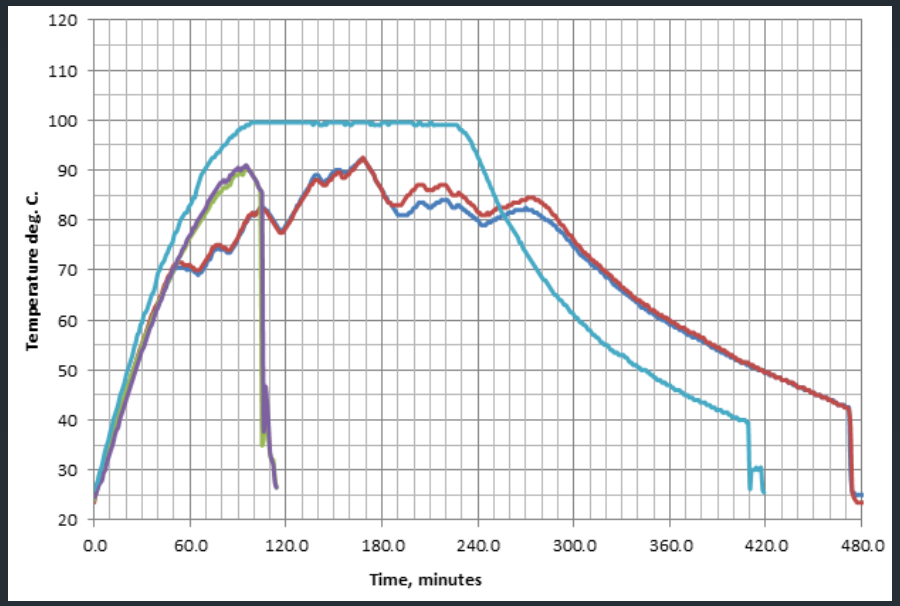
Haines Solar Cookers in Chad, 2016

Photo by P. McArdle, Foreign Service Journal, Jan-Feb. 2016, p. 102

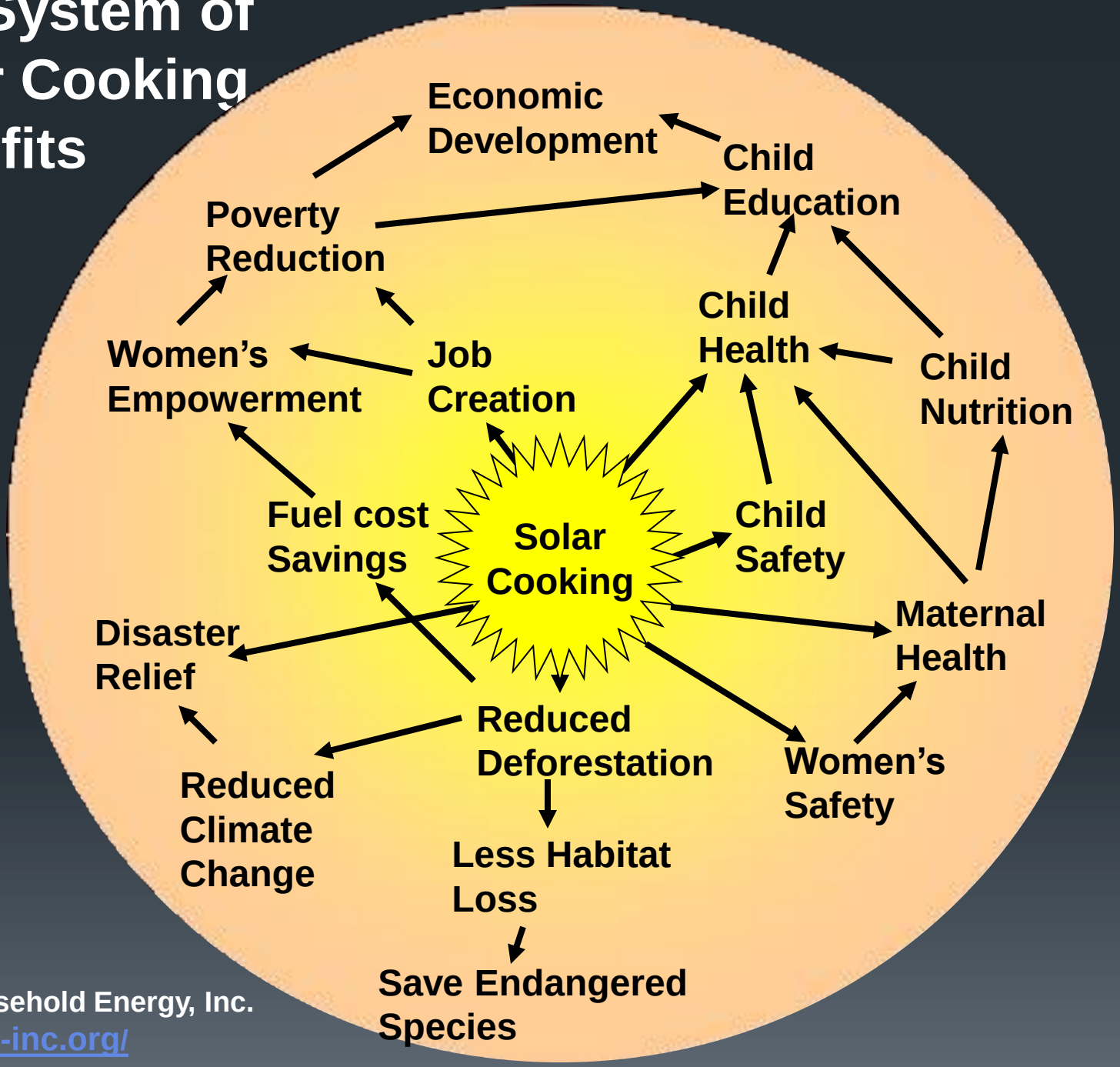
Status of Field Projects, 2016-7

- **Chad:**
  - **250 HotPot solar cookers distributed to Gaga refugee camp in eastern Chad in 2011**
  - **Evaluation in 2016 said "HotPots were found to be clean and in good condition, with no known breakages of the 250 HotPots since the projects started over 4 years ago. Surveying a small sample of women revealed HotPot usage at 2 to 3 times a week…"**
- **Haiti:**
  - **25 "SolSource" parabolic solar cookers distributed 2015 in partnership with the Solar Electric Light Fund**
  - **Evaluation showed "Very high adoption" and "High impact" rates**
- **Kenya:**
  - **500 children cooked lunch in solar cookers as a demo project in Kakuma refugee camp, April 2017**

Project 2: Performance Testing Systems



The System of Solar Cooking Benefits



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Source: Solar Household Energy, Inc.

Challenge to Women (and Men) in Science

- Changing how humanity cooks, like many other global challenges, is a *system* problem that requires a *multidisciplinary effort*
- We have evidence that cooking habits can be changed and new habits sustained
- Consider what skills you can use to expand the awareness and practice of solar cooking!

Some Disciplines Involved in Solar Cooking R&D

- Anthropology
- Business development
- Cooking
- Earth sciences
- Economics
- Food Engineering
- Health care
- International development
- Journalism
- Nutrition
- Physics
- Program management
- Sociology
- Social Work

Our Partners

- Bolivia International Sud Soleil, France
- Dorothy Ann Foundation
- Florida Solar Research Center
- Global Alliance for Clean Cookstoves
- International City-County Management Association
- Lutheran World Relief
- National Presbyterian Church
- Rotary International
- Solar Cookers International
- The Solar Foundation
- UN High Commissioner for Refugees

Source: Solar Household Energy, Inc.

Status of Testing Research

- Designed and constructed a complete weather and 4-channel thermocouple testing system using commercial off-the-shelf instruments and software
- Collected data on several solar cooker models for about 30 days in 2016
- Developed Python software code for data processing to derive power in accordance with ASABE S.580.1 standard
- Sister organization Solar Cookers International developed a portable measurement system based on Arduino, intended for Regional Testing & Knowledge Centers
- Currently collecting and processing data for technical reports in peer-reviewed journals
- One article published in *J. Washington Academy of Sciences*

Project 3: Sociology of Cooking

Photo by S. Showalter, Burkina Faso

What's next: review proposed core indicators of adoption

Working definition of adoption: The characteristics and intensity of use required for a clean cooking technology, of a specific performance tier, to generate the impacts of interest with no indication/desire of household reverting to traditional stove or open fire use.

Description	Indicators
CCS meets user needs	# users satisfied # users who agree available CCS options meet their needs # users who recommend CCS to family/friend
User WTP/invest for maintenance and repair	CCS is/is not in working condition # users report paying money for maintenance/repair # users report maintaining/repairing themselves increase in orders at parts and repair service providers
CCS is the primary stove/fuel for cooking	% of cooking activities completed with other stoves/fuels in the HH % of cooking activities completed with CCS
CCS is displacing traditional stove	% cooking activities completed with traditional stove before CCS purchase % cooking activities completed with traditional stove after CCS purchase
No preference of user to revert to traditional stove use	# users WTP for replacement stove (reported WTP in the future vs. re-purchase of CCS?)

Project 4: Business Models

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Improved Cookstoves -> Sustainable World

Thank you!

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