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Solar Cooking for Human Development and Environmental Relief

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NEW RESEARCH RE-CONFIRMS ACCEPTANCE and BENEFITS of SOLAR COOKING

June 2010

Solar Cooking in El Salvador

The global impact of cooking over open fires is noted and the benefits of solar cooking are summarized. The results of a project introducing solar cooking in El Salvador are reported.

500 Million Cooking Fires

About half the world's population relies on wood for cooking, mostly over open fires. In 2000, fuel wood accounted for 60% of the world's harvest of trees.[1] In many places, use of fuel wood is unsustainable and causes erosion, loss of water quality and reduced biodiversity.[2] Use of agricultural waste products or dung for fuel deprives soil of nutrients. As areas surrounding villages are denuded of trees for fuel wood, inhabitants must travel ever farther to find it, or spend ever more of their meager incomes to buy it.

Open fires also bring other risks, both human and environmental. Cooking over them endangers health from severe burns and smoke inhalation. More people in poor countries die prematurely from indoor smoke than from malaria.[3] Smoke kills 1.6 million women and children every year.[4] Carbon emissions from more than 500 million cooking fires is estimated to account for a substantial percentage of human-generated black carbon emissions which cause global warming.

Cooking with the Sun

Thermal solar cooking technologies offer a healthier, cheaper and more environmentally sustainable alternative to cooking with wood or other more costly fuels. They are already in use by millions in China and India. Unlike photovoltaic cells which convert solar energy to electricity, thermal solar technologies harness and concentrate solar energy directly for cooking food, pasteurizing water and other uses. Solar cooking is healthier and cheaper than cooking with wood or petroleum products, and it is environmentally benign. The fuel is free. Solar cookers are practical, economical cooking tools wherever sunlight is abundant.

Because the sun is not always shining, solar cooking devices are best used as part of an integrated cooking system. This includes, in addition to a solar cooker, a fuel-efficient stove for use on cloudy days or at night that is less polluting and wasteful than open cooking fires,. The performance of both solar cookers and fuel-efficient stoves is enhanced by the retained heat cooker, which can be as simple as a basket filled with pillows of straw or feathers to insulate cooked food and keep it hot for several hours. These three tools together allow a family to cook and pasteurize in all kinds of weather**.**

Solar Cooking Comes of Age

As shortages of traditional fuels increase across the developing world, efforts are redoubling to introduce solar cooking technology. The many benefits of solar cooking are only realized if families willingly accept and use it regularly. This acceptance depends on a wide range of factors from cost to climatic conditions to training to culture and traditional foods. Several studies of these initiatives have been undertaken to evaluate usage and to learn from the experiences. These studies show that improvements in equipment design and advances in training tactics have significantly increased acceptance of the technologies.

For example, in 1998, several types of solar cookers were introduced in Indonesia. Despite an acceptance rate of only 28% the Indonesian Government saw the potential and committed to further investments in solar cooking projects.[5] A 2003 survey of a project to introduce the CooKit solar cooker in Burkina Faso found that 45% of CooKit owners used it 3 to 7 times per week during the dry season.[6]

An analysis of solar cooking in Madagascar found that 75% of people used their solar cookers "regularly."[7] In 2007, a synthesis study covering ten years of solar cooker field tests in South Africa revealed that 83% of families continued to use their solar cookers for an average of one-quarter of their household cooking.[8] The authors of this study concluded that the greater hurdle was not in convincing people to *use* a solar cooker, but to *buy* one because of the high initial cost to low income households.

An Evaluation of Solar Cooking in El Salvador

In 2006, SHE, Inc. began a project in partnership with several local non-governmental organizations in El Salvador to introduce the HotPot solar cooker in six rural communities of medium to extreme poverty. In this project, 125 HotPots were provided in exchange for labor to families in extreme poverty and another 125 were sold on installment, for $30 each. None of the users in this project could have afforded to pay the full commercial price for the units. While the cultural resistance proved much less than anticipated, the affordability hurdle remains a challenge. The search continues for materials and designs that can further reduce costs as well as into additional options for financing the initial purchase costs.

In 2009, a survey of this El Salvador project was conducted by a professional project evaluator in-country.[9] The evaluator found that 86% of the respondents reported using their HotPot at least once a week, with 59% using it three times a week or more. Overall, 92.5% said they were satisfied with the HotPot, citing reasons of saving time, money, cooking oil, and fuel wood, and water.

As almost all of the participating households in these villages use wood-burning stoves for cooking, the primary benefits noted by the users of the HotPot was related to fuel collection and use. Forty percent of respondents reported previously having to travel over a kilometer to gather wood. The survey revealed that after the introduction of solar cooking, 83% of families reported using less fuel wood, with 78% spending less time foraging for it. 77% of those who had purchased fuel wood were buying less of it. Of those with gas stoves, 86% asserted they were using less gas since acquiring the HotPot.

Solar cooks also reported other benefits. Over 76% of interviewees said that solar cooking required less work than cooking with fuel wood or gas, and they noted the reduced risk of burns

from open fires. Even more important was the fact that 88% reported inhaling less smoke since receiving their HotPots. The evaluation revealed that 93% of those receiving HotPot Solar Cookers in this project were satisfied and after 1-3 years found themselves using it at least daily, weather permitting. Some 29% expressed interest in purchasing additional HotPots**.**

Conclusions - Solar Cooking Acceptance and Use in El Salvador

This evaluation from El Salvador is consistent with the rising trend in cultural adoption of solar cooking reflected in other studies of solar cooker usage. It was achieved by appropriate equipment, essential training and intensive follow-up until new solar cooks gained confidence in their cookers.

The study also provided evidence that the purported benefits from solar cooking were actually realized. It demonstrated reduced use and harvest of fuel wood, saving both natural resources and harvesting time and reducing deforestation. It revealed lower household expenditures for other fuel types. The amount of inhaled smoke was significantly reduced. This study clearly demonstrates that under the right climactic and cultural conditions with proper training, solar cooking can gain widespread acceptance and regular use as part of an integrated approach to household cooking, bringing with it real economic, social and environmental benefits.

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[1] OECD/ International Energy Agency, 2008. World Energy Outlook 2008. OECD, Paris France.

[2] UN Food and Agriculture Organization. 2009. Wood Energy. http://www.fao.org/forestry/energy/en/

[3] International Monetary Fund. World Economic Outlook. 2008.

[4] World Health Organization. 2005. Fact Sheet #292, June 2005.

[5] Suharta, H, K. Abdullah, and A. Sayigh. 1998. The solar oven: Development and field-testing of user-made designs in Indonesia. *Solar Energy*. 64: 121-132.

[6] Bontkes, J. S. and W. Jongbloed, 2006. The CooKit: Its introduction, acceptation and follow-up in Gorum-Gorum Burkina Faso. The KoZon Foundation.

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[8] Wentzel, M and Pouris, A. 2007. The development impact of solar cookers: A review of solar cooking impact research in South Africa. Energy Policy Volume 35, Issue 3, pages 1909–1919.

[9] Jurado, M.A. E., Evaluacion de la Fase I y II del Proyecto “Cocinando con el Sol,” Marzo de 2009.